	Universitas Negeri Surabaya Faculty of Engineering, Undergraduate Study Program in Informatics Engineering	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Computational Engineering	5520203098		T=3	P=0	ECTS=4.77	3	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Aditya Prapanca, S.T., M.Kom.

Learning model	**Project Based Learning**	
Program Learning Outcomes (PLO)	**PLO study program that is charged to the course**	
	Program Objectives (PO)	
	PO - 1	Students have the ability to solve root equation problems
	PO - 2	Students have the ability to find solutions to systems of linear equations.
	PLO-PO Matrix	

P.O
PO-1
PO-2

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																

Short Course Description	This course describes modeling engineering problems in the form of mathematical models so that they can be solved using arithmetic operations. Apart from that, we also study the position of numerical methods in solving mathematical models of physical conditions and the types of problems that can be solved using numerical methods. This course also teaches the use and application of numerical methods in a computer program.
References	**Main :**
	1. Chapra, S.C., Canale, R.P. 2006. Numerical Methods for Engineers , 5th ed. McGraw-Hill. 2. Soeharjo. 1985. Analisa Numerik . 3. Munif, A., Prastyoko, A. 1995. Penguasaan dan Penggunaan Metode Numerik . Guna Widya.
	Supporters:
Supporting lecturer	Dr. Yuni Yamasari, S.Kom., M.Kom.

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 the basic concepts of computing techniques.	- Explain the rounding rules. - Explain the error theorem.	**Criteria:** Class Participation Value Attendance Value Assignment Value **Form of Assessment** : Participatory Activities	Approach: Scientific Model: Cooperative Method: Discussion, Presentation 3 X 50	Approach: Scientific Model: Cooperative Method: Discussion, Presentation		0%
2	Students are able to apply the acolade method in solving equation root problems.	- Apply graphic methods to find the roots of equations. - Apply the tabulation method to find the roots of equations. - Apply the bisection method to find the roots of equations. - Apply the Bolzano method to find the roots of equations. - Apply the Regula Falsi method to find the roots of equations.	**Criteria:** Class Participation Value Attendance Value Assignment Value **Form of Assessment** : Participatory Activities	Approach: Scientific Model: Cooperative Method: Discussion, Presentation 3 X 50			0%
3	Students are able to apply the acolade method in solving equation root problems.	- Apply graphic methods to find the roots of equations. - Apply the tabulation method to find the roots of equations. - Apply the bisection method to find the roots of equations. - Apply the Bolzano method to find the roots of equations. - Apply the Regula Falsi method to find the roots of equations.	**Criteria:** Class Participation Value Attendance Value Assignment Value **Form of Assessment** : Participatory Activities	Approach: Scientific Model: Cooperative Method: Discussion, Presentation 3 X 50			40%
4	Students are able to apply open methods in solving root equation problems.	- Applying the one point iteration method to find the roots of the equation. - Apply the Newton-Raphson method to find the roots of equations. - Apply the Secant method to find the roots of equations.	**Criteria:** Class Participation Value Attendance Value Assignment Value **Form of Assessment** : Participatory Activities	Approach: Scientific Model: Cooperative Method: Discussion, Presentation 3 X 50			0%

5	Students are able to apply advanced open methods in solving root equation problems.	- Applying the modified Newton-Raphson method to find the roots of equations. - Apply the factorization method to find the roots of equations. - Applying the Taylor method to finding the roots of equations.	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation 3 X 50			0%
6	Students are able to apply methods for solving systems of linear equations.	- Applying the Iteration method to solving systems of linear equations. - Applying the Jacobi method to solving systems of linear equations. - Applying the Gauss Seidel method to solving systems of linear equations.	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation 3 X 50			0%
7	Students are able to apply curve matching methods that can be used to obtain function curves from discrete values presented in a continuous sequence.	- Explain the definition and function of curve matching. - Applying Linear Regression in creating linear equations. - Applying Least Squares Regression to create non-linear equations. - Applying Polynomial Regression to create polynomial equations.	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation 3 X 50			0%
8	Students are able to apply curve matching methods that can be used to obtain function curves from discrete values presented in a continuous sequence.	- Explain the definition and function of curve matching. - Applying Linear Regression in creating linear equations. - Applying Least Squares Regression to create non-linear equations. - Applying Polynomial Regression to create polynomial equations.	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation 3 X 50			0%

9	Students are able to apply interpolation methods that can be used to obtain function values from a point.	- Applying the finite difference method in finding a function value. - Applying Newton-Gregory interpolation in finding a function value. - Applying Lagrange interpolation in finding a function value. - Applying Gaussian interpolation in finding a function value. - Applying Strirling and Bessel interpolation in finding a function value.	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation 3 X 50			0%
10	Students are able to apply interpolation methods that can be used to obtain function values from a point.	- Applying the finite difference method in finding a function value. - Applying Newton-Gregory interpolation in finding a function value. - Applying Lagrange interpolation in finding a function value. - Applying Gaussian interpolation in finding a function value. - Applying Strirling and Bessel interpolation in finding a function value.	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation 3 X 50			0%
11	Students are able to apply techniques to obtain derivative values of a function by using a given series of function values	- Applying the Newton-Gregory method to obtain derivative values. - Applying the Strirling method to obtain derived values. - Applying the Lagrange method to obtain derivative values.	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation 3 X 50			0%

12	Students are able to apply techniques for calculating the area of a field using a numerical approach	- Apply the trapezoidal method in calculating the area of a plane. - Applying the Simpson method in calculating the area of an area. - Applying the Quadrature method in calculating the area of a field.	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation 3 X 50			0%
13	Students are able to apply the single step technique to obtain the value of a function from the derivative of a given function.	- Apply Euler's method to obtain the value of a function. - Applying the Heun Single Step method to obtain the value of a function. - Apply the Runge-Kutta method to obtain the value of a function.	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation 3 X 50			0%
14	Students are able to apply multi-step techniques to obtain the value of a function from the derivative of a given function.	- Apply the Heun Multi Steps method to obtain the value of a function. - Applying the Adam method in obtaining the value of a function. - Apply Milne's method to obtain the value of a function. - Apply the Adam-Moulton method to obtain the value of a function.	**Criteria:** Class Participation Value Attendance Value Assignment Value **Form of Assessment** : Project Results Assessment / Product Assessment	Approach: Scientific Model: Cooperative Method: Discussion, Presentation 3 X 50			50%
15	Students are able to create computational engineering applications.	- Apply computational engineering methods in creating an application.	**Criteria:** Class Participation Value Attendance Value Assignment Value	Approach: Scientific Model: Cooperative Method: Discussion, Presentation, Practical 3 X 50			0%
16							0%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	40%
2.	Project Results Assessment / Product Assessment	50%
		90%

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.