	Universitas Negeri Surabaya Vocational Faculty, D4 Informatics Management Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Computational Mathematics	5730103203		T=3	P=0	ECTS=4.77	1	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Dodik Arwin Dermawan, S.ST., S.T., M.T.

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	This course examines mathematical applications integrated with computer programming. Applications of mathematics in the field of Computer Science include digital images, digital signals, video, predictions and data science. Application of eigenvalues, eigenvectors, for file/image compression, and also for feature extraction for simple problems in data science. Fourier Transformation, Wavelet Transformation, Noise Reduction, prediction, basic concepts of classification and clustering, their application to surrounding problems, especially related to bio-maths, is studied. This course is project-based, so students are asked to apply what they learn to existing problems around them.
References	**Main :**

1. Bishop, C. M. 2006. Pattern Recognition and Machine Learning . Springer-Verlag.
2. Werner Römisch, Thomas Zeugmann. 2016. Mathematical Analysis and the Mathematics of Computation 1st ed. Springer-Verlag.
3. Rudolf Kruse, and Christian Borgelt. 2016. Computational Intelligence: A Methodological Introduction. Springer-Verlag.

	Supporters:
Supporting lecturer	Dodik Arwin Dermawan, S.ST., S.T., M.T. Hafizhuddin Zul Fahmi, S.Kom., 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	Get to know the work environment of the Mathematics Applications Program	· Solved several math problems with Matlab. · Use some of the functions provided in Matlab · Create your own functions with M-file Editor.		Scientific Approach: observing, asking, exploring Methods: lecture, discussion, question and answer, giving assignments Learning Strategy: accentuation of information processing (cognitive) 3 X 50			0%
2	Get to know the work environment of the Mathematics Applications Program	· Solved several math problems with Matlab. · Use some of the functions provided in Matlab · Create your own functions with M-file Editor.		Scientific Approach: observing, asking, exploring Methods: lecture, discussion, question and answer, giving assignments Learning Strategy: accentuation of information processing (cognitive) 3 X 50			0%
3	Get to know the work environment of the Mathematics Applications Program	· Solved several math problems with Matlab. · Use some of the functions provided in Matlab · Create your own functions with M-file Editor.		Scientific Approach: observing, asking, exploring Methods: lecture, discussion, question and answer, giving assignments Learning Strategy: accentuation of information processing (cognitive) 3 X 50			0%
4	Know the concept of Fourier and Wavelet Transformations and the uses of these two theories.	Able to carry out Fourier and wavelet transformations from simple data either manually or with the help of a computer.		Scientific Approach: observing, asking, exploring Methods: lecture, discussion, question and answer, giving assignments Learning Strategy: accentuation of information processing (cognitive) 3 X 50			0%

5	Know the concept of Fourier and Wavelet Transformations and the uses of these two theories.	Able to carry out Fourier and wavelet transformations from simple data either manually or with the help of a computer.		Scientific Approach: observing, asking, exploring Methods: lecture, discussion, question and answer, giving assignments Learning Strategy: accentuation of information processing (cognitive) 3 X 50			0%
6	Know the application of linear algebra and several mathematical concepts in computing and real problems.	Able to implement digital signal and image compression with PCA Can use matrix decomposition for data security/watermarking Can apply PCA for feature extraction and noise reduction		1. Scientific approach: observing, asking, exploring 2. Method: lecture, discussion, question and answer, giving assignments 3. Learning strategy: accentuation of information processing (cognitive) 3 X 50			0%
7	Know the application of linear algebra and several mathematical concepts in computing and real problems.	Able to implement digital signal and image compression with PCA Can use matrix decomposition for data security/watermarking Can apply PCA for feature extraction and noise reduction		1. Scientific approach: observing, asking, exploring 2. Method: lecture, discussion, question and answer, giving assignments 3. Learning strategy: accentuation of information processing (cognitive) 3 X 50			0%
8				3 X 50			0%
9	Get to know the concept of clustering, namely grouping data (unsupervised learning)	1. Able to perform k-means calculations with simple datasets 2. Able to implement the k-means algorithm in application programs		Scientific Approach: observing, asking, exploring Methods: lecture, discussion, question and answer, giving assignments Learning Strategy: accentuation of information processing (cognitive) 3 X 50			0%

10	Understand the concept of simple classification with the k-nn algorithm	Can implement knn for prediction and classification		Scientific Approach: observing, asking, exploring Methods: lecture, discussion, question and answer, giving assignments Learning Strategy: accentuation of information processing (cognitive) 3 X 50			0%
11	Know the concepts of linear-non-linear, univariate-multivariate regression, and know the use of regression in real problems.	1. Can implement non-linear or linear regression computationally. 2. Can analyze a problem and model it using regression.		Scientific Approach: observing, asking, exploring 3 X 50			0%
12	Implement the material taught in this lecture to real problems			Project presentation 3 X 50			0%
13	Implement the material taught in this lecture to real problems			Project presentation 3 X 50			0%
14	Implement the material taught in this lecture to real problems			3 X 50			0%
15	Able to apply mathematical computing to real problems then present and express applied and experimental results in scientific articles.			Presentations and group discussions, uploading articles on 3 X 50 online pages			0%
16	Able to apply mathematical computing to real problems then present and express applied and experimental results in scientific articles.			Presentations and group discussions, uploading articles on 3 X 50 online pages			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.