					Document Code
	Universitas Negeri Surabaya **Faculty of Engineering** **, Information Technology Education Undergraduate Study Program**				

SEMESTER LEARNING PLAN

Courses		CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Digital Image Processing		8320702136	Study Program Elective Courses	**T=3**	**P=0**	**ECTS=4.77**	5	July 17, 2024
AUTHORIZATION		**SP Developer**		**Course Cluster Coordinator**			**Study Program Coordinator**	
		....		....			Drs. Bambang Sujatmiko, M.T.	

Learning model	**Project Based Learning**

Program Learning Outcomes (PLO)	**PLO study program which is charged to the course**	
	PLO-8	Mastering the concepts and implementation in developing software engineering, games, intelligent multimedia, and network computer engineering.
	PLO-13	Able to develop innovative educational products or learning resources using scientific design-based strategies to support teaching activities that can be integrated with ICT.
	Program Objectives (PO)	
	PLO-PO Matrix	

P.O	PLO-8	PLO-13

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	Explanation of the concepts of Digital Image Processing, Image Representation, Morphology Process, Preprocessing, Normalization Process, Image Restoration, Enhancement Process, Segmentation Process, Feature Extraction, Recognition Process, and Evaluation stages on images, as well as being able to create a simple program to solve a problem in the image field processing.

References	**Main :**	
	1. Parker, J.R., 1997. Algorithms for Image Processing and Computer Vision, John Wiley & Sons, Inc. 2. Gonzales, R.C., and Woods, R. E. 2002. Digital Image Processing. Prentice Hall. 3. Pratt,W.K.. 2007. Digital Image Processing, John Wiley & Sons, Inc. 4. Russ,John C. 2007. The Image Processing Handbook, fifth edition. CRC Press.	
	Supporters:	

Supporting lecturer	Setya Chendra Wibawa, S.Pd., M.T. Martini Dwi Endah Susanti, S.Kom., M.Kom. Ramadhan Cakra Wibawa, S.Pd., 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	Explain the concept of digital image processing	1. Explain the meaning of digital image processing 2. Explain the steps in digital image processing 3. Explain the components of an image processing system	**Form of Assessment** : Participatory Activities	Approach: Scientific Model: Problem-based learning Method: Discussion, Presentation, Practical 3 X 50	Approach: Scientific Model: Problem-based learning Method: Discussion, Presentation, 3 X 50 online practicum	**Material:** Explaining the Basic Concepts of Digital Images **References:** *Sulistiyanti, SR, Setyawan, A., and Komarudin, M. 2016. Basic Image Processing and Examples of Its Application. Technoscience.*	2%
2	Implementing the basics of digital imagery in everyday life	1. Explain the basics of digital imaging 2. Applying the basics of digital images in programming using Matlab	**Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Practical Assessment	Approach: Scientific Model: Problem-based learning Method: Discussion, Presentation, Practicum 3 X 50	Approach: Scientific Model: Problem-based learning Method: Discussion, Presentation, online Practicum 3 X 50	**Material:** Explaining the basics of images and their application in Matlab **Reference:** *Sulistiyanti, SR, Setyawan, A., and Komarudin, M. 2016. Basic Image Processing and Examples of Its Application. Technoscience.*	2%
3	Implementing the basics of digital imagery in everyday life	1. Explain the basics of digital imaging 2. Applying the basics of digital images in programming using Matlab	**Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Practical Assessment	Approach: Scientific Model: Problem-based learning Method: Discussion, Presentation, Practicum 3 X 50	Approach: Scientific Model: Problem-based learning Method: Discussion, Presentation, online Practicum 3 X 50	**Material:** Explaining the basics of images and their application in Matlab **Reference:** *Sulistiyanti, SR, Setyawan, A., and Komarudin, M. 2016. Basic Image Processing and Examples of Its Application. Technoscience.*	3%
4	Implementing Image Enhancement in the Spatial Domain in everyday life	1. Explaining Image Enhancement in the Spatial Domain 2. Applying Image Enhancement in the Spatial Domain in programming using Matlab	**Criteria:** - **Form of Assessment** : Participatory Activities, Practical Assessment	Approach: Scientific Model: Problem-based learning Method: Discussion, Presentation, Practicum 3 X 50	Approach: Scientific Model: Problem-based learning Method: Discussion, Presentation, online Practicum 3 X 50	**Material:** Explaining Image Enhancement in the Spatial Domain and Application in Matblab **Library:** *Sulistiyanti, SR, Setyawan, A., and Komarudin, M. 2016. Basic Image Processing and Examples of Its Application. Technoscience.*	3%
5	Implementing Image Enhancement in the Spatial Domain in everyday life	1. Explaining Image Enhancement in the Spatial Domain 2. Applying Image Enhancement in the Spatial Domain in programming using Matlab	**Criteria:** - **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Practical Assessment	Approach: Scientific Model: Problem-based learning Method: Discussion, Presentation, Practicum 3 X 50	Approach: Scientific Model: Problem-based learning Method: Discussion, Presentation, online Practicum 3 X 50	**Material:** Explaining Image Enhancement in the Spatial Domain and Application in Matblab **Library:** *Sulistiyanti, SR, Setyawan, A., and Komarudin, M. 2016. Basic Image Processing and Examples of Its Application. Technoscience.*	3%

6	Implementing Image Enhancement in the Frequency Domain in everyday life	1.Explaining Image Enhancement in the Frequency 2.Applying Image Enhancement in the Frequency 3.Domain in programming using Matlab	**Criteria:** - **Form of Assessment** : Participatory Activities, Practical Assessment	Approach: Scientific Model: Problem-based learning Method: Discussion, Presentation, Practicum 3 X 50	Approach: Scientific Model: Problem-based learning Method: Discussion, Presentation, online Practicum 3 X 50	**Material:** Explaining Image Enhancement and Application in Matlab **Reference:** *Sulistiyanti, SR, Setyawan, A., and Komarudin, M. 2016. Basic Image Processing and Examples of Its Application. Technoscience.*	3%
7	Implementing Image Enhancement in the Frequency Domain in everyday life	1.Explaining Image Enhancement in the Frequency 2.Applying Image Enhancement in the Frequency 3.Domain in programming using Matlab	**Criteria:** - **Form of Assessment** : Participatory Activities	Approach: Scientific Model: Problem-based learning Method: Discussion, Presentation, Practicum 3 X 50	Approach: Scientific Model: Problem-based learning Method: Discussion, Presentation, online Practicum 3 X 50	**Material:** Explaining Image Enhancement and Application in Matlab **Reference:** *Sulistiyanti, SR, Setyawan, A., and Komarudin, M. 2016. Basic Image Processing and Examples of Its Application. Technoscience.*	3%
8	UTS	UTS	**Criteria:** - **Form of Assessment** : Project Results Assessment / Product Assessment, Test	UTS 2 X 50	UTS 2 X 50	**Material:** Everything that has been taught from meetings 1-7 **References:** *Sulistiyanti, SR, Setyawan, A., and Komarudin, M. 2016. Basic Image Processing and Examples of Its Application. Technoscience.*	25%

| 9 | Implementing Image Restoration in real life | 1. Explaining Image Restoration 2. Applying Image Restoration 3. Applying image restoration in programming using Matlab | **Criteria:** - **Forms of Assessment** : Participatory Activities, Portfolio Assessment, Practical Assessment | 1. Students observe the problem given by the lecturer, referring to the topic that has been agreed upon during the lesson. In groups, students discuss to formulate hypotheses related to the problems they face. 2. Students begin to prepare the project that will be worked on to answer the hypothesis that has been prepared 3. Students prepare a schedule for completing the project that will be worked on 4. Students carry out the stages of the project according to the schedule that they have prepared (the lecturer observes each stage of the student project that is being worked on) 5 . Students make reports related to projects that have been carried out within the specified time period. 6. Students reveal the experiences that have been carried out by displaying the outcomes of projects that have been completed. 3 X 50 | 1. Students observe the problem given by the lecturer, referring to the topic that has been agreed upon during the lesson. In groups, students discuss to formulate hypotheses related to the problems they face. 2. Students begin to prepare the project that will be worked on to answer the hypothesis that has been prepared 3. Students prepare a schedule for completing the project that will be worked on 4. Students carry out the stages of the project according to the schedule that they have prepared (the lecturer observes each stage of the student project that is being worked on) 5 . Students make reports related to projects that have been carried out within the specified time period. 6. Students reveal the experiences that have been carried out by displaying the outcomes of projects that have been completed. 3 X 50 | **Material:** Explaining Image Restoration and Application in Matlab **Reference:** *Sulistiyanti, SR, Setyawan, A., and Komarudin, M. 2016. Basic Image Processing and Examples of Its Application. Technoscience.* | 3% |

| 10 | Implementing Image Restoration in real life | 1. Explaining Image Restoration 2. Applying Image Restoration 3. Applying image restoration in programming using Matlab | **Criteria:** - **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Practical Assessment | 1. Students observe the problem given by the lecturer, referring to the topic that has been agreed upon during the lesson. In groups, students discuss to formulate hypotheses related to the problems they face. 2. Students begin to prepare the project that will be worked on to answer the hypothesis that has been prepared 3. Students prepare a schedule for completing the project that will be worked on 4. Students carry out the stages of the project according to the schedule that they have prepared (the lecturer observes each stage of the student project that is being worked on) 5 . Students make reports related to projects that have been carried out within the specified time period. 6. Students reveal the experiences that have been carried out by displaying the outcomes of projects that have been completed. 3 X 50 | 1. Students observe the problem given by the lecturer, referring to the topic that has been agreed upon during the lesson. In groups, students discuss to formulate hypotheses related to the problems they face. 2. Students begin to prepare the project that will be worked on to answer the hypothesis that has been prepared 3. Students prepare a schedule for completing the project that will be worked on 4. Students carry out the stages of the project according to the schedule that they have prepared (the lecturer observes each stage of the student project that is being worked on) 5 . Students make reports related to projects that have been carried out within the specified time period. 6. Students reveal the experiences that have been carried out by displaying the outcomes of projects that have been completed. | **Material:** Explaining Image Restoration and its Application in Matlab **Reference:** *Sulistiyanti, SR, Setyawan, A., and Komarudin, M. 2016. Basic Image Processing and Examples of Its Application. Technoscience.* | 3% |

| 11 | Implementing Image Restoration in real life | 1. Explaining Image Restoration 2. Applying Image Restoration 3. Applying image restoration in programming using Matlab | **Criteria:** - **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Portfolio Assessment, Practical Assessment, Practice / Performance | 1. Students observe the problem given by the lecturer, referring to the topic that has been agreed upon during the lesson. In groups, students discuss to formulate hypotheses related to the problems they face. 2. Students begin to prepare the project that will be worked on to answer the hypothesis that has been prepared 3. Students prepare a schedule for completing the project that will be worked on 4. Students carry out the stages of the project according to the schedule that they have prepared (the lecturer observes each stage of the student project that is being worked on) 5 . Students make reports related to projects that have been carried out within the specified time period. 6. Students reveal the experiences that have been carried out by displaying the outcomes of projects that have been completed. 3 X 50 | 1. Students observe the problem given by the lecturer, referring to the topic that has been agreed upon during the lesson. In groups, students discuss to formulate hypotheses related to the problems they face. 2. Students begin to prepare the project that will be worked on to answer the hypothesis that has been prepared 3. Students prepare a schedule for completing the project that will be worked on 4. Students carry out the stages of the project according to the schedule that they have prepared (the lecturer observes each stage of the student project that is being worked on) 5 . Students make reports related to projects that have been carried out within the specified time period. 6. Students reveal the experiences that have been carried out by displaying the outcomes of projects that have been completed. 3 X 50 | **Material:** Explaining Image Restoration and Application in Matlab **Reference:** *Sulistiyanti, SR, Setyawan, A., and Komarudin, M. 2016. Basic Image Processing and Examples of Its Application. Technoscience.* | 3% |

| 12 | Implementing image segmentation in real life | 1.Explaining Image Segmentation 2.Applying Image Segmentation to real life in Matlab | **Criteria:** - **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Portfolio Assessment | 1. Students observe the problem given by the lecturer, referring to the topic that has been agreed upon during the lesson. In groups, students discuss to formulate hypotheses related to the problems they face. 2. Students begin to prepare the project that will be worked on to answer the hypothesis that has been prepared 3. Students prepare a schedule for completing the project that will be worked on 4. Students carry out the stages of the project according to the schedule that they have prepared (the lecturer observes each stage of the student project that is being worked on) 5 . Students make reports related to projects that have been carried out within the specified time period. 6. Students reveal the experiences that have been carried out by displaying the outcomes of projects that have been completed. 3 X 50 | 1. Students observe the problem given by the lecturer, referring to the topic that has been agreed upon during the lesson. In groups, students discuss to formulate hypotheses related to the problems they face. 2. Students begin to prepare the project that will be worked on to answer the hypothesis that has been prepared 3. Students prepare a schedule for completing the project that will be worked on 4. Students carry out the stages of the project according to the schedule that they have prepared (the lecturer observes each stage of the student project that is being worked on) 5 . Students make reports related to projects that have been carried out within the specified time period. 6. Students reveal the experiences that have been carried out by displaying the outcomes of projects that have been completed. | **Material:** Explaining Image Segmentation and Application in Matlab **Reference:** *Sulistiyanti, SR, Setyawan, A., and Komarudin, M. 2016. Basic Image Processing and Examples of Its Application. Technoscience.* | 3% |

| 13 | Implementing image segmentation in real life | 1. Explaining Image Segmentation 2. Applying Image Cementation to real life in Matlab | **Criteria:** - **Forms of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment, Portfolio Assessment, Practical Assessment, Practice / Performance | 1. Students observe the problem given by the lecturer, referring to the topic that has been agreed upon during the lesson. In groups, students discuss to formulate hypotheses related to the problems they face. 2. Students begin to prepare the project that will be worked on to answer the hypothesis that has been prepared 3. Students prepare a schedule for completing the project that will be worked on 4. Students carry out the stages of the project according to the schedule that they have prepared (the lecturer observes each stage of the student project that is being worked on) 5 . Students make reports related to projects that have been carried out within the specified time period. 6. Students reveal the experiences that have been carried out by displaying the outcomes of projects that have completed. 3 X 50 | 1. Students observe the problem given by the lecturer, referring to the topic that has been agreed upon during the lesson. In groups, students discuss to formulate hypotheses related to the problems they face. 2. Students begin to prepare the project that will be worked on to answer the hypothesis that has been prepared 3. Students prepare a schedule for completing the project that will be worked on 4. Students carry out the stages of the project according to the schedule that they have prepared (the lecturer observes each stage of the student project that is being worked on) 5 . Students make reports related to projects that have been carried out within the specified time period. 6. Students reveal the experiences that have been carried out by displaying the outcomes of projects that have been completed. 3 X 50 | **Material:** Explaining Image Segmentation and Application in Matlab **Reference:** *Sulistiyanti, SR, Setyawan, A., and Komarudin, M. 2016. Basic Image Processing and Examples of Its Application. Technoscience.* | 3% |

| 14 | Implementing object recognition | 1. Explain the concept of object recognition
2. Applying object recognition in Matlab programming | **Criteria:**
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Form of Assessment : Participatory Activities, Project Results Assessment / Product Assessment | 1. Students observe the problem given by the lecturer, referring to the topic that has been agreed upon during the lesson. In groups, students discuss to formulate hypotheses related to the problems they face.
2. Students begin to prepare the project that will be worked on to answer the hypothesis that has been prepared
3. Students prepare a schedule for completing the project that will be worked on
4. Students carry out the stages of the project according to the schedule that they have prepared (the lecturer observes each stage of the student project that is being worked on)
5 . Students make reports related to projects that have been carried out within the specified time period.
6. Students reveal the experiences that have been carried out by displaying the outcomes of projects that have been completed.
3 X 50 | 1. Students observe the problem given by the lecturer, referring to the topic that has been agreed upon during the lesson. In groups, students discuss to formulate hypotheses related to the problems they face.
2. Students begin to prepare the project that will be worked on to answer the hypothesis that has been prepared
3. Students prepare a schedule for completing the project that will be worked on
4. Students carry out the stages of the project according to the schedule that they have prepared (the lecturer observes each stage of the student project that is being worked on)
5 . Students make reports related to projects that have been carried out within the specified time period.
6. Students reveal the experiences that have been carried out by displaying the outcomes of projects that have been completed. | **Material:** Explaining Object Recognition and its Application in Matlab
Reference: *Sulistiyanti, SR, Setyawan, A., and Komarudin, M. 2016. Basic Image Processing and Examples of Its Application. Technoscience.* | 3% |

| 15 | Implementing object recognition | 1. Explain the concept of object recognition
2. Applying object recognition in Matlab programming | **Criteria:**
-
Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment, Practical Assessment, Practical / Performance | 1. Students observe the problem given by the lecturer, referring to the topic that has been agreed upon during the lesson. In groups, students discuss to formulate hypotheses related to the problems they face.
2. Students begin to prepare the project that will be worked on to answer the hypothesis that has been prepared
3. Students prepare a schedule for completing the project that will be worked on
4. Students carry out the stages of the project according to the schedule that they have prepared (the lecturer observes each stage of the student project that is being worked on)
5 . Students make reports related to projects that have been carried out within the specified time period.
6. Students reveal the experiences that have been carried out by displaying the outcomes of projects that have been completed.
3 X 50 | 1. Students observe the problem given by the lecturer, referring to the topic that has been agreed upon during the lesson. In groups, students discuss to formulate hypotheses related to the problems they face.
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4. Students carry out the stages of the project according to the schedule that they have prepared (the lecturer observes each stage of the student project that is being worked on)
5 . Students make reports related to projects that have been carried out within the specified time period.
6. Students reveal the experiences that have been carried out by displaying the outcomes of projects that have been completed.
3 X 50 | **Material:** Explaining Object Recognition and its Application in Matlab
Reference: *Sulistiyanti, SR, Setyawan, A., and Komarudin, M. 2016. Basic Image Processing and Examples of Its Application. Technoscience.* | 3% |
| 16 | | Final exams | **Criteria:**
Final exams

Forms of Assessment : Project Results Assessment / Product Assessment, Portfolio Assessment, Practical Assessment, Practice / Performance, Tests | Final Exam Semester
2 X 50 | 3 X 50 Semester Final Exam | **Material:** Everything that has been taught from the 9-15 meeting
References: *Sulistiyanti, SR, Setyawan, A., and Komarudin, M. 2016. Basic Image Processing and Examples of Its Application. Technoscience.* | 35% |

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	17.12%
2.	Project Results Assessment / Product Assessment	27.62%
3.	Portfolio Assessment	10.2%
4.	Practical Assessment	16.62%
5.	Practice / Performance	8.95%
6.	Test	19.5%
		100%

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.