



**Universitas Negeri Surabaya  
Faculty of Engineering,  
Electrical Engineering Undergraduate Study Program**

**Document  
Code**

**SEMESTER LEARNING PLAN**

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Artificial Intelligence and Big Data Analytics	2020102408	Study Program Elective Courses	T=2	P=0	ECTS=3.18	5	July 18, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Dr. Lusia Rakhmawati, S.T., M.T.

Learning model	Case Studies
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Program Learning Outcomes (PLO)	PLO study program that is charged to the course																																																																																																					
	Program Objectives (PO)																																																																																																					
	PO - 1	Master the theoretical concepts of architecture, infrastructure, processing methods and data management, big data technology and be able to formulate appropriate solutions to data problems.																																																																																																				
	PO - 2	Master the theoretical concepts of artificial intelligence algorithms, machine learning and intelligent computing, and be able to formulate problem solving in big data according to the problem domain with the best algorithm																																																																																																				
	PO - 3	Able to create computational models to support decision making by applying artificial intelligence algorithms independently or in groups with a full sense of responsibility																																																																																																				
	PO - 4	Able to apply parameter tuning methods in order to produce the best quality output independently with a full sense of responsibility																																																																																																				
	PLO-PO Matrix																																																																																																					
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>P.O</td></tr> <tr><td>PO-1</td></tr> <tr><td>PO-2</td></tr> <tr><td>PO-3</td></tr> <tr><td>PO-4</td></tr> </table>	P.O	PO-1	PO-2	PO-3	PO-4																																																																																																
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PO Matrix at the end of each learning stage (Sub-PO)																																																																																																						
	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2">P.O</th> <th colspan="16">Week</th> </tr> <tr> <th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>10</th><th>11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th> </tr> </thead> <tbody> <tr><td>PO-1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>PO-4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	P.O	Week																1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	PO-1																	PO-2																	PO-3																	PO-4																
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Short Course Description	In this course, students focus on learning to apply the concept of acquisition/retrieval of various kinds of data from various sources and teach about the application of artificial intelligence methods, namely techniques for making machines/computers smart. So that machines and computers are able to think and make decisions like humans when acting. Apart from that, this course teaches about the application of artificial intelligence methods, starting from knowledge representation, search methods, language computing, Single-Layer Perceptron (Forward and Backpropagation), Loss Function & Gradient Descent, and MultiLayer Forward Propagation. Students also study the creation and development of artificial intelligence-based algorithms in solving multidisciplinary problems which will ultimately produce proven innovative work using the case study learning model.
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References	Main :	
	Supporters:	<ol style="list-style-type: none"> <li>Bernard Marr, Data Strategy: How to Profit from a World of Big Data, Analytics and Artificial Intelligence, 2018</li> <li>EMC Education Services, Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, Wiley, 2015</li> </ol>

Supporting lecturer		Dr. Raden Roro Hapsari Peni Agustin Tjahyaningtjas, S.Si., M.T. Dr. Lilik Anifah, S.T., M.T.					
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 Definition, Emergence Phenomenon, Properties, Complexity, and Framework of Big Data as well as understand the motivation or background of basic techniques and methods of machine intelligence	Students are able to understand the Definition, Emergence Phenomenon, Properties, Complexity, and Framework of Big Data as well as understand the motivation or background of basic techniques and methods of machine intelligence	<b>Criteria:</b> 1.1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30% 2.2.USS weight 20% 3.3. Students' activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20% 4.4.US weight 30% 5.5.Essay questions are assessed together at USS 6.6. Multiple choice questions are assessed together on US 7.7. Performance questions are integrated during learning	Presentation and Discussion 2x 50 minutes			5%
2	Students are able to understand the R programming review, introduction to MapReduce tools	Students are able to understand the R programming review, introduction to MapReduce tools	<b>Criteria:</b> 1.1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30% 2.2.USS weight 20% 3.3. Students' activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20% 4.4.US weight 30% 5.5.Essay questions are assessed together at USS 6.6. Multiple choice questions are assessed together on US 7.7. Performance questions are integrated during learning	Presentation and Discussion 2x 50 minutes			5%

3	Students are able to understand the R programming review, introduction to MapReduce tools	Students are able to understand how to do Hadoop, Spark, data collection, Web scraping in R API, HTML and Selenium	<b>Criteria:</b> 1.1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30% 2.2.USS weight 20% 3.3. Students' activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20% 4.4.US weight 30% 5.5.Essay questions are assessed together at USS 6.6. Multiple choice questions are assessed together on US 7.7. Performance questions are integrated during learning	Presentation and Discussion 2x 50 minutes			10%
4	Students are able to understand the R programming review, introduction to MapReduce tools	Students are able to do web scrapping	<b>Criteria:</b> 1.1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30% 2.2.USS weight 20% 3.3. Students' activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20% 4.4.US weight 30% 5.5.Essay questions are assessed together at USS 6.6. Multiple choice questions are assessed together on US 7.7. Performance questions are integrated during learning	Presentation and Discussion 2x 50 minutes			10%

5	Students are able to understand how to pre-process data and visualize data	Students are able to understand how to pre-process data and visualize data	<b>Criteria:</b> 1.1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30% 2.2.USS weight 20% 3.3. Students' activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20% 4.4.US weight 30% 5.5.Essay questions are assessed together at USS 6.6. Multiple choice questions are assessed together on US 7.7. Performance questions are integrated during learning	Presentation and Discussion 2x 50 minutes			30%
6	Students are able to carry out Structured Data Analysis, Unstructured Data Analysis, and Text Analysis	Students are able to carry out Structured Data Analysis, Unstructured Data Analysis, and Text Analysis	<b>Criteria:</b> 1.1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30% 2.2.USS weight 20% 3.3. Students' activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20% 4.4.US weight 30% 5.5.Essay questions are assessed together at USS 6.6. Multiple choice questions are assessed together on US 7.7. Performance questions are integrated during learning	Presentation and Discussion 2x 50 minutes			5%

7	Students are able to carry out Structured Data Analysis, Unstructured Data Analysis, and Text Analysis	Students are able to carry out Structured Data Analysis, Unstructured Data Analysis, and Text Analysis	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30%</li> <li>2.2.USS weight 20%</li> <li>3.3. Students' activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20%</li> <li>4.4.US weight 30%</li> <li>5.5.Essay questions are assessed together at USS</li> <li>6.6. Multiple choice questions are assessed together on US</li> <li>7.7. Performance questions are integrated during learning</li> </ol>	<p>Project base learning: Prepare important questions related to a topic of Structured Data Analysis, Unstructured Data Analysis, and Text Analysis. Prepare a project plan for Structured Data Analysis, Unstructured Data Analysis , and Text Analysis. Make a project schedule for Structured Data Analysis, Unstructured Data Analysis, and Text Analysis. Monitoring the implementation of project-based learning (project based learning) Testing and providing assessments on projects created Evaluation of project-based learning 2x 50 minutes</p>			10%
8	Students are able to carry out Structured Data Analysis, Unstructured Data Analysis, and Text Analysis	Students are able to carry out Structured Data Analysis, Unstructured Data Analysis, and Text Analysis	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30%</li> <li>2.2.USS weight 20%</li> <li>3.3. Students' activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20%</li> <li>4.4.US weight 30%</li> <li>5.5.Essay questions are assessed together at USS</li> <li>6.6. Multiple choice questions are assessed together on US</li> <li>7.7. Performance questions are integrated during learning</li> </ol> <p><b>Form of Assessment :</b> Practice / Performance</p>	<p>Project base learning: Prepare important questions related to a topic of Structured Data Analysis, Unstructured Data Analysis, and Text Analysis. Prepare a project plan for Structured Data Analysis, Unstructured Data Analysis , and Text Analysis. Make a project schedule for Structured Data Analysis, Unstructured Data Analysis, and Text Analysis. Monitoring the implementation of project-based learning (project based learning) Testing and providing assessments on projects created Evaluation of project-based learning 2x 50 minutes</p>			20%

9	Students can understand techniques in artificial intelligence	Students can understand techniques in artificial intelligence	<b>Criteria:</b> 1.1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30% 2.2.USS weight 20% 3.3. Students' activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20% 4.4.US weight 30% 5.5.Essay questions are assessed together at USS 6.6. Multiple choice questions are assessed together 7.7. Performance questions are integrated during learning	Presentation and Discussion 2x50			10%
10	Able to understand Evolutionary: Genetic Algorithms case in Searching, (Blind search and inform search)	1.understand about searching techniques 2.understand the definition of problem space, production systems, and searching methods 3.understand searching techniques: Blind Search 4.understand the 6 Blind Search methods and know their performance 5.know the advantages and disadvantages of each Blind Search method 6.understand searching techniques: Informed Search 7.know the advantages and disadvantages of each Informed Search method 8.can complete the Informed Search case study	<b>Criteria:</b> 1.1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30% 2.2.USS weight 20% 3.3. Students' activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20% 4.4.US weight 30% 5.5.Essay questions are assessed together at USS 6.6. Multiple choice questions are assessed together 7.7. Performance questions are integrated during learning  <b>Forms of Assessment :</b> Participatory Activities, Project Results Assessment / Product Assessment	Project based learning: Preparing important questions related to a material topic Genetic Algorithm case in Searching, (Blind search and inform search) Preparing a project plan Genetic Algorithm case in Searching, (Blind search and inform search) Monitoring the implementation of project based learning (project based learning) Testing and provide an assessment of the project created Evaluation of project-based learning Searching, (Blind search and inform search) Making a project schedule Genetic Algorithms case in Searching, (Blind search and inform search) 2x50			10%

11	Able to understand Evolutionary: Genetic Algorithm case in Searching (Fuzzy System)	<ol style="list-style-type: none"> <li>1.Reviewing Propositional Logic and FirstOrder Logic</li> <li>2.Understanding Fuzzy Systems</li> <li>3.Understand the Reasoning technique and its differences with Searching</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30%</li> <li>2.2.USS weight 20%</li> <li>3.3. Students' activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20%</li> <li>4.4.US weight 30%</li> <li>5.5.Essay questions are assessed together at USS</li> <li>6.6. Multiple choice questions are assessed together</li> <li>7.7. Performance questions are integrated during learning</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities</p>	Project based learning: Preparing important questions related to a material topic Algorithm Preparing a project plan Monitoring the implementation of project based learning Testing and providing an assessment of the project created Evaluation of project based learning Creating a project schedule Algorithm 2x50			10%
12	Able to understand Evolutionary: Genetic Algorithm case in Searching (Fuzzy System)	<ol style="list-style-type: none"> <li>1.understand Planning techniques and their differences with Reasoning and Searching</li> <li>2.know Goal-StarckPlanning (GSP) planning methods and Constraint Posting</li> <li>3.Understand the Reasoning technique and its differences with Searching</li> <li>4.can solve problems using the Planning method</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30%</li> <li>2.2.USS weight 20%</li> <li>3.3. Students' activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20%</li> <li>4.4.US weight 30%</li> <li>5.5.Essay questions are assessed together at USS</li> <li>6.6. Multiple choice questions are assessed together</li> <li>7.7. Performance questions are integrated during learning</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities</p>	Project based learning: Preparing important questions related to a material topic Algorithm Preparing a project plan Monitoring the implementation of project based learning Testing and providing an assessment of the project created Evaluation of project based learning Creating a project schedule Algorithm 2x50			10%

13	Able to understand Evolutionary: Genetic Algorithms case in Learning (Decision Tree Learning and Artificial Neural Networks)	<ol style="list-style-type: none"> <li>1. understand the definition of Learning</li> <li>2. know the difference between Searching, Reasoning, Planning and Learning</li> <li>3. understand the Decision Tree Learning technique</li> <li>4. understand ANN techniques</li> <li>5. solving problems using Decision Tree and ANN techniques</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30%</li> <li>2.2. USS weight 20%</li> <li>3.3. Students' activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20%</li> <li>4.4. US weight 30%</li> <li>5.5. Essay questions are assessed together at USS</li> <li>6.6. Multiple choice questions are assessed together</li> <li>7.7. Performance questions are integrated during learning</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities</p>	Project based learning: Preparing important questions related to a material topic Algorithm Preparing a project plan Monitoring the implementation of project based learning Testing and providing an assessment of the project created Evaluation of project based learning Creating a project schedule Algorithm 2x50			10%
14	Able to understand Evolutionary: Genetic Algorithms case in Learning (Decision Tree Learning and Artificial Neural Networks)	<ol style="list-style-type: none"> <li>1. understand the definition of Learning</li> <li>2. know the difference between Searching, Reasoning, Planning and Learning</li> <li>3. understand Deep Learning techniques</li> <li>4. solving problems with Deep Learning</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30%</li> <li>2.2. USS weight 20%</li> <li>3.3. Students' activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20%</li> <li>4.4. US weight 30%</li> <li>5.5. Essay questions are assessed together at USS</li> <li>6.6. Multiple choice questions are assessed together</li> <li>7.7. Performance questions are integrated during learning</li> </ol> <p><b>Form of Assessment :</b> Participatory Activities</p>	Project based learning: Preparing important questions related to a material topic Algorithm Preparing a project plan Monitoring the implementation of project based learning Testing and providing an assessment of the project created Evaluation of project based learning Creating a project schedule Algorithm 2x50			10%



15	Able to understand Evolutionary: Genetic Algorithms case in Learning (Decision Tree Learning and Artificial Neural Networks)	<ol style="list-style-type: none"> <li>1. understand the definition of Learning</li> <li>2. know the difference between Searching, Reasoning, Planning and Learning</li> <li>3. understand Deep Learning techniques</li> <li>4. solving problems with Deep Learning</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30%</li> <li>2.2. USS weight 20%</li> <li>3.3. Students' activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20%</li> <li>4.4. US weight 30%</li> <li>5.5. Essay questions are assessed together at USS</li> <li>6.6. Multiple choice questions are assessed together</li> <li>7.7. Performance questions are integrated during learning</li> </ol> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment</p>	Project based learning: Preparing important questions related to a material topic Algorithm Preparing a project plan Monitoring the implementation of project based learning Testing and providing an assessment of the project created Evaluation of project based learning Creating a project schedule Algorithm 2x50		10%
16	Able to understand Evolutionary: Genetic Algorithms case in Learning (Decision Tree Learning and Artificial Neural Networks)	<ol style="list-style-type: none"> <li>1. understand the definition of Learning</li> <li>2. know the difference between Searching, Reasoning, Planning and Learning</li> <li>3. understand Deep Learning techniques</li> <li>4. solving problems with Deep Learning</li> </ol>	<p><b>Criteria:</b></p> <ol style="list-style-type: none"> <li>1.1. Practical reports and products are assessed as ASSIGNMENTS with a weight of 30%</li> <li>2.2. USS weight 20%</li> <li>3.3. Students' activities and responses during learning activities, especially practicums, are assessed as participation, with a weight of 20%</li> <li>4.4. US weight 30%</li> <li>5.5. Essay questions are assessed together at USS</li> <li>6.6. Multiple choice questions are assessed together</li> <li>7.7. Performance questions are integrated during learning</li> </ol> <p><b>Form of Assessment :</b> Project Results Assessment / Product Assessment, Test</p>	Project based learning: Preparing important questions related to a material topic Algorithm Preparing a project plan Monitoring the implementation of project based learning Testing and providing an assessment of the project created Evaluation of project based learning Creating a project schedule Algorithm 2x50		20%

**Evaluation Percentage Recap: Case Study**

No	Evaluation	Percentage
1.	Participatory Activities	45%
2.	Project Results Assessment / Product Assessment	25%
3.	Practice / Performance	20%
4.	Test	10%
		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.