



**Universitas Negeri Surabaya**  
**Faculty of Mathematics and Natural Sciences**  
**Data Science Undergraduate Study Program**

**Document Code**

**SEMESTER LEARNING PLAN**

Courses	CODE	Course Family	Credit Weight	SEMESTER	Compilation Date
Data Mining	4920203033	Compulsory Study Program Subjects	T=2 P=1 ECTS=4.77	4	July 18, 2024
<b>AUTHORIZATION</b>	<b>SP Developer</b>		<b>Course Cluster Coordinator</b>	<b>Study Program Coordinator</b>	
	Ulfa Siti Nuraini		Elly Matul Imah	Yuliani Puji Astuti, S.Si., M.Si.	

<b>Learning model</b>	<b>Project Based Learning</b>																																																																																		
<b>Program Learning Outcomes (PLO)</b>	<b>PLO study program that is charged to the course</b>																																																																																		
	<b>PLO-8</b> Work together and have social sensitivity and bring change to the environment																																																																																		
	<b>PLO-12</b> Able to design and develop algorithms for various purposes such as big data analysis, artificial intelligence, databases, data mining, inferential statistics, algorithm design and analysis, and data warehouse.																																																																																		
	<b>PLO-18</b> Mastering information technology concepts both in terms of computing and data management to solve data science problems																																																																																		
	<b>Program Objectives (PO)</b>																																																																																		
	<b>PO - 1</b> Understand the processes and issues involved in data mining																																																																																		
	<b>PO - 2</b> Learn various data mining techniques for data streams, series, sequences, text, and web																																																																																		
	<b>PO - 3</b> Apply the above techniques to solve data mining problems																																																																																		
	<b>PLO-PO Matrix</b>																																																																																		
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <th>P.O</th> <th>PLO-8</th> <th>PLO-12</th> <th>PLO-18</th> </tr> <tr> <td>PO-1</td> <td></td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>PO-2</td> <td></td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>PO-3</td> <td></td> <td style="text-align: center;">✓</td> <td></td> </tr> </table>	P.O	PLO-8	PLO-12	PLO-18	PO-1		✓		PO-2		✓		PO-3		✓																																																																			
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	<b>PO Matrix at the end of each learning stage (Sub-PO)</b>																																																																																		
<table border="1" style="margin-left: auto; margin-right: auto;"> <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> <tr> <td>PO-1</td> <td style="text-align: center;">✓</td><td style="text-align: center;">✓</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 style="text-align: center;">✓</td><td style="text-align: center;">✓</td><td style="text-align: center;">✓</td><td style="text-align: center;">✓</td><td style="text-align: center;">✓</td><td></td><td style="text-align: center;">✓</td><td></td><td style="text-align: center;">✓</td><td style="text-align: center;">✓</td><td></td><td style="text-align: center;">✓</td><td></td> </tr> <tr> <td>PO-3</td> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td style="text-align: center;">✓</td><td></td><td style="text-align: center;">✓</td><td></td><td></td><td style="text-align: center;">✓</td><td></td><td style="text-align: center;">✓</td><td style="text-align: center;">✓</td> </tr> </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								✓		✓			✓		✓	✓
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**Short Course Description** This course is a project-based course that studies the processes and issues involved in data mining, data mining concepts in data streams, series, sequences, text and web, as well as techniques for solving data mining problems.

<b>References</b>	<p><b>Main :</b></p> <ol style="list-style-type: none"> <li>1. Han, J., Kamber, M. and J. Pei, Data Mining: Concepts and Techniques. Morgan Kaufmann, 3rd ed., 2011</li> <li>2. Tan, P.-N. , Steinbach, M. and Kumar, V., Introduction to Data Mining 2nd edition, Pearson, 2018</li> <li>3. Nisbet, R. and Elder, J., Handbook of Statistical Analysis and Data Mining 2nd edition, Academic Press, 2017</li> <li>4. Zhang, Z., &amp; Zhang, R. Multimedia data mining: a systematic introduction to concepts and theory. CRC Press. 2008</li> </ol> <p><b>Supporters:</b></p> <ol style="list-style-type: none"> <li>1. Han, J., Pei, J., &amp; Tong, H. (2022). Data mining: concepts and techniques. Morgan kaufmann. USA</li> <li>2. Han, J. &amp; Kamber, M. (2006). Data mining concepts and techniques second edition. Morgan Kaufmann Publishers. USA</li> </ol>
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Supporting lecturer		Dr. Wiyli Yustanti, S.Si., M.Kom. Dr. Elly Matul Imah, M.Kom. Ulfa Siti Nuraini, S.Stat., M.Stat.					
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 explain the basic concepts of data mining	1.Can explain the basic concepts of data mining 2.Can mention data mining applications in various fields	<b>Criteria:</b> Non Test  <b>Form of Assessment :</b> Participatory Activities	Collaborative Learning (Lectures, discussions and questions and answers) 150	Collaborative Learning (Lectures, discussions and questions and answers) Independent Learning 150	<b>Material:</b> - understanding Data Mining (DM), KDD (Knowledge Discovery in Database), AI (Artificial Intelligence), ML (Machine Learning) - Reasons for using DM - Data Types - KDD Process - DM Application - DM Software - DM Method <b>Library:</b> Han, J., Kamber, M. and J. Pei, <i>Data Mining: Concepts and Techniques.</i> Morgan Kaufmann, 3rd ed., 2011	1%
2	Students are able to carry out data preprocessing	Can perform data preprocessing	<b>Criteria:</b> Non Test  <b>Form of Assessment :</b> Participatory Activities	Collaborative Learning (Lectures, discussions and questions and answers) 150	Collaborative Learning (Lectures, discussions and questions and answers) Independent Learning 150	<b>Material:</b> PreProcessing <b>Bibliography:</b> Han, J., Kamber, M. and J. Pei, <i>Data Mining: Concepts and Techniques.</i> Morgan Kaufmann, 3rd ed., 2011	1%
3	Students are able to explain the introduction to Data Warehouse, OLAP Technology	Can explain the introduction of Data Warehouse and OLAP Technology	<b>Criteria:</b> Non Test  <b>Form of Assessment :</b> Participatory Activities	Collaborative Learning (Lectures, discussions and questions and answers) 150	Collaborative Learning (Lectures, discussions and questions and answers) Independent Learning 150	<b>Material:</b> Introduction to Data warehousing and Introduction to OLAP (Online Analytical Processing) <b>References:</b> Han, J., Kamber, M. and J. Pei, <i>Data Mining: Concepts and Techniques.</i> Morgan Kaufmann, 3rd ed., 2011  <b>Material:</b> Data Warehouse <b>References:</b> Han, J., Kamber, M. and J. Pei, <i>Data Mining: Concepts and Techniques.</i> Morgan Kaufmann, 3rd ed., 2011	1%

4	Students are able to understand the introduction to Data Cube and Data Generalization	Can explain the introduction of Data Warehouse and OLAP Technology	<b>Criteria:</b> Non Test  <b>Form of Assessment :</b> Participatory Activities	Collaborative Learning (Lectures, discussions and questions and answers) 150	Collaborative Learning (Lectures, discussions and questions and answers) Independent Learning 150	<b>Material:</b> Data Cube Computation - Data Cube Computation Methods: Multiway Array Aggregation, BUC, Star-Cubing - Multidimensiona <b>References:</b> <i>Han, J., Kamber, M. and J. Pei, Data Mining: Concepts and Techniques. Morgan Kaufmann, 3rd ed., 2011</i>	1%
5	Students are able to understand the Mining Frequent Patterns, Association and Correlations procedures	Can carry out Mining Frequent Patterns, Association and Correlations procedures	<b>Criteria:</b> Non Test  <b>Form of Assessment :</b> Participatory Activities, Practical Assessment	Collaborative Learning (Lectures, discussions and questions and answers) 150	Collaborative Learning (Lectures, discussions and questions and answers) Independent Learning 150	<b>Material:</b> Market Based Analysis; Mining Associations rules: Apriori Methods; Recommender System: Collaborative Filtering <b>Bibliography:</b> <i>Han, J., Kamber, M. and J. Pei, Data Mining: Concepts and Techniques. Morgan Kaufmann, 3rd ed., 2011</i>	1%
6	Students are able to explain the conceptual concepts of Mining Stream, Time Series and Sequence Data	1.Can understand the concept of Mining Stream 2.Can understand the concept of Time Series Data 3.Can understand the concept of Sequence data	<b>Criteria:</b> Non Test  <b>Form of Assessment :</b> Practical Assessment	Collaborative Learning (Lectures, discussions and questions and answers) 150	Collaborative Learning (Lectures, discussions and questions and answers) Independent Learning 150	<b>Material:</b> Mining concepts in data streams; Mining concepts in time series data; Mining concepts in sequence data <b>References:</b> <i>Han, J., Kamber, M. and J. Pei, Data Mining: Concepts and Techniques. Morgan Kaufmann, 3rd ed., 2011</i>	2%
7	Students are able to explain the concepts of classification and prediction	1.Can understand the concepts of classification and prediction 2.Can carry out classification and prediction methods in real data	<b>Criteria:</b> Non Test  <b>Form of Assessment :</b> Participatory Activities	Collaborative Learning (Lectures, discussions and questions and answers) 150	Collaborative Learning (Lectures, discussions and questions and answers) Independent Learning 150	<b>Material:</b> Classification and prediction concepts; Model evaluation and selection <b>References:</b> <i>Han, J., Kamber, M. and J. Pei, Data Mining: Concepts and Techniques. Morgan Kaufmann, 3rd ed., 2011</i>	1%
8	Midterm exam	Midterm exam	<b>Criteria:</b> Writing test  <b>Form of Assessment :</b> Test	150 Midterm Exam	150 Midterm Exam	<b>Material:</b> Chapter 1 - Chapter 8 <b>References:</b> <i>Han, J., Kamber, M. and J. Pei, Data Mining: Concepts and Techniques. Morgan Kaufmann, 3rd ed., 2011</i>	20%

9	Students are able to understand the concept of clustering	<ol style="list-style-type: none"> <li>1.Can understand the concept of clustering analysis</li> <li>2.Can carry out clustering methods in real data</li> </ol>	<b>Criteria:</b> Non Test  <b>Form of Assessment :</b> Practical Assessment	Collaborative Learning (Lectures, discussions and questions and answers) 150	Collaborative Learning (Lectures, discussions and questions and answers) Independent Learning 150	<b>Material:</b> Conceptual of Clustering Analysis, Partitioning methods, Hierarchical Methods, DensityBased Methods, Grid-Based Methods, Evaluation of Clustering <b>Literature:</b> Han, J., Kamber, M. and J. Pei, <i>Data Mining: Concepts and Techniques</i> . Morgan Kaufmann, 3rd ed., 2011	3%
10	Students can implement data mining on real problems and realize creative ideas related to data mining and present the results of scientific analysis	<ol style="list-style-type: none"> <li>1.Can explain creative data mining ideas from real problems</li> <li>2.Realizing ideas from projects that have been given</li> </ol>	<b>Criteria:</b> Test  <b>Form of Assessment :</b> Project Results Assessment / Product Assessment	Presentations, Questions and Answers 150	Discussion on LMS 150	<b>Material:</b> Developing research questions, literature study, <b>library method design:</b>	10%
11	Students are able to understand the concepts of Graph Mining and Social Network Analysis	<ol style="list-style-type: none"> <li>1.Can understand the concept of Graph Mining</li> <li>2.Can understand the concept of Social Network Analysis</li> </ol>	<b>Criteria:</b> Non Test  <b>Form of Assessment :</b> Participatory Activities	Collaborative Learning (Lectures, discussions and questions and answers) 150	Collaborative Learning (Lectures, discussions and questions and answers) Independent Learning 150	<b>Material:</b> Graph pattern mining - statistical modeling of networks - data cleaning, integration, and validation by network analysis - clustering and classification of graphs - homogeneous and heterogeneous networks <b>References:</b> Han, J., Kamber, M. and J. Pei, <i>Data Mining : Concepts and Techniques</i> . Morgan Kaufmann, 3rd ed., 2011	1%
12	Students are able to understand the concepts of Mining Objects, Spatial and Multimedia Data	Can understand the concepts of Mining Object, Spatial and Multimedia Data	<b>Criteria:</b> Non Test  <b>Form of Assessment :</b> Participatory Activities	Collaborative Learning (Lectures, discussions and questions and answers) 150	Collaborative Learning (Lectures, discussions and questions and answers) Independent Learning 150	<b>Material:</b> The concept of mining objects: movement patterns of multiple moving objects - The concept of mining on spatial data, temporal data, and spatiotemporal data - The concept of mining on multimedia data: text, image, video, and audio data <b>References:</b> Han, J., Kamber, M. and J. Pei, <i>Data Mining: Concepts and Techniques</i> . Morgan Kaufmann, 3rd ed., 2011	1%

13	Students can implement data mining on real problems and realize creative ideas related to data mining and present the results of scientific analysis	1.Can explain the progress of realizing creative data mining ideas from real problems 2.Realizing creative ideas scientifically	<b>Criteria:</b> Test  <b>Form of Assessment :</b> Project Results Assessment / Product Assessment	Presentations, Questions and Answers 150	Discussion on LMS 150	<b>Material:</b> - Method Implementation - Results Analysis - Conclusion <b>Literature:</b>	10%
14	Students are able to understand the conceptual framework related to Mining Text and Mining Web Data.	1.Can explain the concept of text mining 2.Can explain the concept of web data mining 3.Can apply text and web data mining to real cases	<b>Criteria:</b> Non Test  <b>Form of Assessment :</b> Practical Assessment	Collaborative Learning (Lectures, discussions and questions and answers) 150	Collaborative Learning (Lectures, discussions and questions and answers) Independent learning 150	<b>Material:</b> Text mining: Text categorization, text clustering, sentiment analysis, document summarization, and entity - relation modeling - Mining Web data: web content mining, web structure mining, and web usage mining <b>References:</b> <i>Han, J., Kamber, M. and J. Pei, Data Mining: Concepts and Techniques. Morgan Kaufmann, 3rd ed., 2011</i>	2%
15	Students can implement data mining on real problems and realize creative ideas related to data mining and present the results of scientific analysis	1.Can explain the progress of realizing creative data mining ideas from real problems 2.Realizing creative ideas scientifically	<b>Criteria:</b> Test  <b>Form of Assessment :</b> Project Results Assessment / Product Assessment	Presentations, Questions and Answers 150	Discussion on LMS 150	<b>Material:</b> Method Implementation - Results Analysis - Conclusion <b>Literature:</b>	15%
16	Students can implement data mining on real problems and realize creative ideas related to data mining and present the results of scientific analysis	Presentation and question and answer	<b>Criteria:</b> Test  <b>Form of Assessment :</b> Project Results Assessment / Product Assessment, Portfolio Assessment	Presentations, Questions and Answers 150	Upload Final Report in LMS 150	<b>Material:</b> Chapter 1 - Chapter 11 <b>References:</b> <i>Han, J., Kamber, M. and J. Pei, Data Mining: Concepts and Techniques. Morgan Kaufmann, 3rd ed., 2011</i>	30%

#### Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	7.5%
2.	Project Results Assessment / Product Assessment	50%
3.	Portfolio Assessment	15%
4.	Practical Assessment	7.5%
5.	Test	20%
		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.