



**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 in Power Systems	2020102056	Compulsory Study Program Subjects	T=2	P=0	ECTS=3.18	8	April 10, 2023																																																																																																																					
AUTHORIZATION	SP Developer		Course Cluster Coordinator			Study Program Coordinator																																																																																																																						
	Endryansyah, S.T., M.T.		Prof. Dr. I Gusti Putu Asto B., M.T.			Dr. Lusia Rakhmawati, S.T., M.T.																																																																																																																						
Learning model	Project Based Learning																																																																																																																											
Program Learning Outcomes (PLO)	PLO study program that is charged to the course																																																																																																																											
	Program Objectives (PO)																																																																																																																											
	PO - 1	Able to apply basic knowledge of industrial robots to gain a thorough understanding of engineering principles.																																																																																																																										
	PO - 2	Able to communicate effectively both verbally and in writing regarding the topic of Artificial Intelligence in Power Systems																																																																																																																										
	PO - 3	Able to apply basic methods and skills of Artificial Intelligence in Power Systems that are needed to solve problems in the engineering field																																																																																																																										
	PO - 4	Able to work in cross-disciplinary and cultural arts teams																																																																																																																										
	PO - 5	Able to understand the need for lifelong learning in the field of Artificial Intelligence in Power Systems related to relevant current issues																																																																																																																										
	PLO-PO Matrix																																																																																																																											
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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> <tr><td>PO-5</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																	PO-5																
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Short Course Description	The artificial intelligence course in this course will provide the basics of artificial intelligence which focuses on several applications of artificial intelligence and several problem solving techniques in artificial intelligence known as soft computing. Apart from that, study several theories and applications of intelligent systems																																																																																																																											
References	Main :																																																																																																																											
	1. Suyanto. 2014. <i>Artificial Intelligence revisi kedua</i> . informatika Bandung Russel, Stuart. 2011 . <i>Artificial Intelligence : a modern Approach</i> , pearson																																																																																																																											
	Supporters:																																																																																																																											

1. Pitowarno, Endra. 2016. Robotika; Desain, Kontrol, dan Kecerdasan Buatan Edisi 1. Yogyakarta: Andi.							
Supporting lecturer		Endryansyah, S.T., M.T. Unit Three Kartini, S.T., M.T., Ph.D.					
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	Know and be able to explain and understand the basic concepts of artificial intelligence	1. Accuracy in explaining the definition of the concept of artificial intelligence	Criteria: 1.The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight 2) 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6.Student Final Grade: 7.Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. Form of Assessment : Participatory Activities	Presentations and assignments 2 X 50		Material: Meeting material 1 Reference: Suyanto. 2014. <i>Artificial Intelligence second revision . Bandung informatics</i> Russell, Stuart. 2011 . <i>Artificial Intelligence : a modern approach, Pearson</i>	5%

2	Able to explain the artificial intelligence problem space along with the conditions that follow and provide an analytical picture of the production rules of each problem space	1. Accuracy in explaining the conditions and analysis of the description of the production rules for each problem area	<p>Criteria:</p> <ol style="list-style-type: none"> 1. The assessment criteria are carried out by looking at aspects: <ol style="list-style-type: none"> 2.1. Participation: carried out by observing student activities (weight 2) 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6. Student Final Grade: 7. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. <p>Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment</p>	Presentations and assignments 2 X 50		<p>Material: Meeting material 2 References: Suyanto. 2014. <i>Artificial Intelligence second revision . Bandung informatics</i></p> <p>Russell, Stuart. 2011 . <i>Artificial Intelligence : a modern approach, Pearson</i></p>	0%
3	Able to explain and understand the concept of search methods in artificial intelligence	The concept of search methods in artificial intelligence	<p>Criteria:</p> <ol style="list-style-type: none"> 1. The assessment criteria are carried out by looking at aspects: <ol style="list-style-type: none"> 2.1. Participation: carried out by observing student activities (weight 2) 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6. Student Final Grade: 7. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. <p>Form of Assessment : Participatory Activities</p>	Presentations and assignments 2 X 50		<p>Material: Meeting material 3 References: Suyanto. 2014. <i>Artificial Intelligence second revision . Bandung informatics</i></p> <p>Russell, Stuart. 2011 . <i>Artificial Intelligence : a modern approach, Pearson</i></p>	5%

4	Able to explain and solve artificial intelligence problems using blind search methods and solve artificial intelligence problems using heuristic search methods	Explain the ANN method and its application to electric power systems	<p>Criteria:</p> <ol style="list-style-type: none"> 1. The assessment criteria are carried out by looking at aspects: <ol style="list-style-type: none"> 2.1. Participation: carried out by observing student activities (weight 2) 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6. Student Final Grade: 7. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. <p>Form of Assessment : Participatory Activities</p>	Presentation, Power Point, Assignment 2 X 50		<p>Material: Meeting material 4</p> <p>References: Suyanto. 2014. <i>Artificial Intelligence second revision . Bandung informatics</i></p> <p>Russell, Stuart. 2011 . <i>Artificial Intelligence : a modern approach, Pearson</i></p>	0%
5	Able to explain reasoning techniques grammatically in propositional logic, semantically in propositional logic, inference rules	a. Propositional Logic analysis and evaluation b. Inference System	<p>Criteria:</p> <ol style="list-style-type: none"> 1. The assessment criteria are carried out by looking at aspects: <ol style="list-style-type: none"> 2.1. Participation: carried out by observing student activities (weight 2) 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6. Student Final Grade: 7. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. <p>Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment</p>	Presentation, Power Point, Assignment 2 X 50		<p>Material: Meeting material 5</p> <p>References: Suyanto. 2014. <i>Artificial Intelligence second revision . Bandung informatics</i></p> <p>Russell, Stuart. 2011 . <i>Artificial Intelligence : a modern approach, Pearson</i></p>	0%

6	Able to explain and understand reasoning techniques using first order logic	1. Definition of the concept of First Order Logic	<p>Criteria:</p> <ol style="list-style-type: none"> 1. The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight 2) 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6. Student Final Grade: 7. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. <p>Form of Assessment : Participatory Activities</p>	Presentation, Power Point, Assignment 2 X 50		<p>Material: Meeting material 6 References: Suyanto. 2014. <i>Artificial Intelligence second revision . Bandung informatics</i></p> <p>Russell, Stuart. 2011 . <i>Artificial Intelligence : a modern approach, Pearson</i></p>	5%
7	Able to understand and explain fuzzy logic analysis, engineering processes for knowledge using fuzzy logic, fuzzines, fuzzy sets, and defuzzification, decision tree learning	1. Fuzzy Logic	<p>Criteria:</p> <ol style="list-style-type: none"> 1. The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight 2) 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6. Student Final Grade: 7. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. <p>Form of Assessment : Participatory Activities</p>	Lectures, discussions, working on case studies Informed search. Doing 2 X 50 assignments		<p>Material: Meeting material 7 Literature: Suyanto. 2014. <i>Artificial Intelligence second revision . Bandung informatics</i></p> <p>Russell, Stuart. 2011 . <i>Artificial Intelligence : a modern approach, Pearson</i></p>	5%

8	UTS	UTS	Criteria: 1. UTS: carried out with an assessment during the middle of the semester (weight 2)	UTS 2 X 50		Material: Meeting material 1-7 Reader: <i>Pitowarno, Endra. 2016. Robotics; Design, Control and Artificial Intelligence Edition 1. Yogyakarta: Andi.</i>	10%
9	Able to explain the basic concepts of Artificial Neural Networks (NN)	Artificial Neural Networks	Criteria: 1. The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight 2) 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6. Student Final Grade: 7. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. Form of Assessment : Project Results Assessment / Product Assessment	Lectures/discussions 2 X 50		Material: Meeting material 9 Literature: Suyanto. 2014. Artificial Intelligence second revision . Bandung informatics Russell, Stuart. 2011 . Artificial Intelligence : a modern approach, Pearson	0%

10	Able to explain and understand Problem Analysis using the Artificial Neural Network (NN) model	Feed forward propagation Back propagation calculates weight and bias values	<p>Criteria:</p> <ol style="list-style-type: none"> 1. The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight 2) 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6. Student Final Grade: 7. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	Lectures, discussions, working on case studies, Informed search, practicum. Doing the big task of programming 2 X 50		<p>Material: Meeting material 10 Literature: Suyanto. 2014. <i>Artificial Intelligence second revision . Bandung informatics</i></p> <p>Russell, Stuart. 2011 . <i>Artificial Intelligence : a modern approach, Pearson</i></p>	10%
11	Able to explain and understand problem analysis using supervised learning and unsupervised learning processes	Feed forward propagation Back propagation calculates weight and bias values	<p>Criteria:</p> <ol style="list-style-type: none"> 1. The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight 2) 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6. Student Final Grade: 7. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. <p>Form of Assessment : Project Results Assessment / Product Assessment</p>	Lectures, discussions, working on case studies Informed search, Doing assignments 2 X 50		<p>Material: Meeting material 12 Reader: Pitowarno, Endra. 2016. <i>Robotics; Design, Control and Artificial Intelligence Edition 1. Yogyakarta: Andi.</i></p>	5%

12	able to explain and carry out parameter analysis and applications of artificial neural networks in the field of electrical engineering for electric power systems	Parameter analysis and application of artificial neural networks in the field of electrical engineering for electric power systems	<p>Criteria:</p> <ol style="list-style-type: none"> 1. The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight 2) 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6. Student Final Grade: 7. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. <p>Forms of Assessment : Participatory Activities, Project Results Assessment / Product Assessment</p>	Lectures/discussions 2 X 50		<p>Material: Meeting material 12 Literature: Suyanto. 2014. Artificial Intelligence second revision . Bandung informatics</p> <p>Russell, Stuart. 2011 . Artificial Intelligence : a modern approach, Pearson</p>	0%
13	Understand the definition and application of the Genetic Algorithm model	Definition of genetic algorithm Example of application of genetic algorithm calculations	<p>Criteria:</p> <ol style="list-style-type: none"> 1. The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight 2) 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6. Student Final Grade: 7. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. <p>Form of Assessment : Participatory Activities</p>	Lectures, discussions, working on case studies Informed search, Assignment 2 X 50		<p>Material: Meeting material 13 Reader: Pitowarno, Endra. 2016. Robotics; Design, Control and Artificial Intelligence Edition 1. Yogyakarta: Andi.</p>	5%

14	Able to explain analyzing and evaluating functional approach models, computational and interdisciplinary models in cognitive science	functional approach models, computational and interdisciplinary models in cognitive science	<p>Criteria:</p> <ol style="list-style-type: none"> 1. The assessment criteria are carried out by looking at aspects: <ol style="list-style-type: none"> 2.1. Participation: carried out by observing student activities (weight 2) 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6. Student Final Grade: 7. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10. <p>Form of Assessment : Participatory Activities</p>	Lectures, discussions, working on case studies Informed search. Doing 2 X 50 assignments		<p>Material: Meeting material 14 References: Suyanto. 2014. <i>Artificial Intelligence second revision</i> . Bandung informatics</p> <p>Russell, Stuart. 2011 . <i>Artificial Intelligence : a modern approach</i>, Pearson</p>	5%
15	Able to explain and implement artificial intelligence as a whole in the form of intelligent system applications	Implementation of artificial intelligence as a whole in the form of intelligent system applications	<p>Criteria:</p> <ol style="list-style-type: none"> 1. The assessment criteria are carried out by looking at aspects: <ol style="list-style-type: none"> 2.1. Participation: carried out by observing student activities (weight 2) 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6. Student Final Grade: 7. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10 <p>Form of Assessment : Participatory Activities</p>	Lectures, discussions, working on case studies Informed search. Doing 2 X 50 artificial intelligence tasks		<p>Material: Meeting material 15 References: Suyanto. 2014. <i>Artificial Intelligence second revision</i> . Bandung informatics</p> <p>Russell, Stuart. 2011 . <i>Artificial Intelligence : a modern approach</i>, Pearson</p>	5%

16	UAS	UAS	<p>Criteria:</p> <ol style="list-style-type: none"> 1. The assessment criteria are carried out by looking at aspects: 2.1. Participation: carried out by observing student activities (weight 2) 3.2. UTS: carried out with an assessment during the middle of the semester (weight 2) 4.3. UAS: carried out every semester to measure all indicators (weight 3) 5.4. Task: carried out on each indicator (weight 3) 6. Student Final Grade: 7. Participation Score (2) x Assignment Score (3) x UTS Score (2) x UAS Score (3) divided by 10 <p>Form of Assessment : Participatory Activities</p>	UAS 2 X 50		<p>Material: Meeting material 1-15</p> <p>References: Suyanto. 2014. <i>Artificial Intelligence second revision . Bandung informatics</i></p> <p>Russell, Stuart. 2011 . <i>Artificial Intelligence : a modern approach, Pearson</i></p>	10%
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Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	45%
2.	Project Results Assessment / Product Assessment	15%
		60%

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.

