	Universitas Negeri Surabaya Faculty of Postgraduate School, Master of Technology and Vocational Education Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Artificial intelligence	8310103010		T=3	P=0	ECTS=6.72	1	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	Prof. Dr. I.G.P. Asto Buditjahjanto, S.T.,M.T.	.....	Dr. Ir. Achmad Imam Agung, M.Pd.

Learning model	**Project Based Learning**

Program Learning Outcomes (PLO)

PLO study program which is charged to the course

Program Objectives (PO)

PO - 1	Master the theoretical concepts and principles of Artificial Intelligence.
PO - 2	Able to utilize various alternative solutions to Artificial Intelligence problems.
PO - 3	Examining the results of Artificial Intelligence research
PO - 4	Able to produce scientific studies related to Artificial Intelligence.

PLO-PO Matrix

P.O
PO-1
PO-2
PO-3
PO-4

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
PO-1																
PO-2																
PO-3																
PO-4																

Short Course Description	This course studies the concept of Artificial Intelligence. The material coverage consists of basic concepts of Artificial Intelligence, Artificial Intelligence design, problem solving in Artificial Intelligence cases

References

Main :

1. Devendra K. Chaturvedi, Soft Computing Techniques and its Applications in Electrical Engineering, ©2008 Springer-Verlag Berlin Heidelberg
2. Wolfgang Ertel, Introduction to Artificial Intelligence, © Springer-Verlag London Limited 2011

Supporters:

Supporting lecturer	Prof. Dr. I Gusti Putu Asto Buditjahjanto, 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	Understanding Artificial Neural Networks and Supervised Learning	1.- Students are able to explain Adaline 2.- Students are able to explain ANN Learning. 3.- Students are able to explain Back-Propagation Learning	**Criteria:** Students are able to demonstrate and simulate the ANN Learning process **Form of Assessment** : Participatory Activities	Presentations, Lectures and discussions. 3x 50‘‘		**Material:** Adaline, ANN Learning, Back-Propagation Learning **Reference:** *Wolfgang Ertel, Introduction to Artificial Intelligence, © Springer-Verlag London Limited 2011*	5%
2	Understanding Factors Affecting the Performance of Artificial Neural Network Models	1.- Students are able to explain Network Complexity 2.- Students are able to explain problem complexity 3.- Students are able to explain learning complexity	**Criteria:** Students are able to demonstrate and simulate ANN models **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentations, Lectures and discussions. 3x 50‘‘		**Material:** Network Complexity, Problem Complexity, Learning Complexity **Reference:** *Wolfgang Ertel, Introduction to Artificial Intelligence, © Springer-Verlag London Limited 2011*	5%
3	Understanding Factors Affecting the Performance of Artificial Neural Network Models	1.- Students are able to explain Network Complexity 2.- Students are able to explain problem complexity 3.- Students are able to explain learning complexity	**Criteria:** Students are able to demonstrate and simulate ANN models **Form of Assessment** : Participatory Activities, Project Results Assessment / Product Assessment	Presentations, Lectures and discussions. 3x 50‘‘		**Material:** Network Complexity, Problem Complexity, Learning Complexity **Reference:** *Wolfgang Ertel, Introduction to Artificial Intelligence, © Springer-Verlag London Limited 2011*	5%
4	- Understanding the Fuzzy Set Theoretical Approach	1.- Students are able to explain the Fuzzy Set. 2.- Students are able to explain Operations on Fuzzy Sets 3.- Students are able to explain the characteristics of fuzzy sets	**Criteria:** Students are able to demonstrate and simulate Operations on Fuzzy Sets **Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, Lectures and discussions. 3x 50‘‘		**Material:** Fuzzy Set, Operations on Fuzzy Sets, Characteristics of Fuzzy Sets **Reference:** *Devendra K. Chaturvedi, Soft Computing Techniques and its Applications in Electrical Engineering, ©2008 Springer-Verlag Berlin Heidelberg*	5%

5	- Understanding the Fuzzy Set Theoretical Approach	1.- Students are able to explain the Fuzzy Set. 2.- Students are able to explain Operations on Fuzzy Sets 3.- Students are able to explain the characteristics of fuzzy sets	**Criteria:** Students are able to demonstrate and simulate Operations on Fuzzy Sets **Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, Lectures and discussions. 3x 50''		**Material:** Fuzzy Set, Operations on Fuzzy Sets, Characteristics of Fuzzy Sets **Reference:** *Devendra K. Chaturvedi, Soft Computing Techniques and its Applications in Electrical Engineering, ©2008 Springer-Verlag Berlin Heidelberg*	5%
6	- Understanding Applications of Fuzzy Rule Based Systems	1.- Students are able to explain System's Modeling and Simulation Using Fuzzy Logic Approach. 2.- Students are able to explain Control Applications	**Criteria:** Students are able to demonstrate and simulate Control Applications using fuzzy **Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, Lectures and discussions. 3x 50''		**Material:** System's Modeling and Simulation Using Fuzzy, Control Applications **Reference:** *Devendra K. Chaturvedi, Soft Computing Techniques and its Applications in Electrical Engineering, ©2008 Springer-Verlag Berlin Heidelberg*	5%
7	- Understanding Applications of Fuzzy Rule Based Systems	1.- Students are able to explain System's Modeling and Simulation Using Fuzzy Logic Approach. 2.- Students are able to explain Control Applications	**Criteria:** Students are able to demonstrate and simulate Control Applications using fuzzy **Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, Lectures and discussions. 3x 50''		**Material:** System's Modeling and Simulation Using Fuzzy, Control Applications **Reference:** *Devendra K. Chaturvedi, Soft Computing Techniques and its Applications in Electrical Engineering, ©2008 Springer-Verlag Berlin Heidelberg*	5%
8	UTS	Students are able to demonstrate and simulate UTS questions	**Criteria:** Able to analyze and present UTS answers **Form of Assessment** : Project Results Assessment / Product Assessment, Test	3x 50'' Presentation		**Material:** meetings 1-7 **References:** *Devendra K. Chaturvedi, Soft Computing Techniques and its Applications in Electrical Engineering, ©2008 Springer-Verlag Berlin Heidelberg* **Material:** meetings 1-7 **References:** *Wolfgang Ertel, Introduction to Artificial Intelligence, © Springer-Verlag London Limited 2011*	10%

9	- Understanding Genetic Algorithms	1.- Students can explain the main components of GA. 2.- Students can explain the Effect of Mutation Probability on GA Performance	**Criteria:** 1. Students can explain the basics of the GA process **Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, Lectures and discussions.		**Material:** Main Components of GA, Effect of Mutation Probability on GA Performance **Reference:** *Wolfgang Ertel, Introduction to Artificial Intelligence, © Springer-Verlag London Limited 2011*	5%
10	Understanding Applications of Genetic Algorithms to Load Forecasting Problems	1.- Students are able to explain the Development of Improved Genetic Algorithm 2.- Students are able to explain the Application of Improved Genetic Algorithm	**Criteria:** Students are able to demonstrate and simulate the Improved Genetic Algorithm **Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, Lectures and discussions. 3x 50‘‘		**Material:** Development of Improved Genetic Algorithm, Application of Improved Genetic Algorithm **Reference:** *Devendra K. Chaturvedi, Soft Computing Techniques and its Applications in Electrical Engineering, ©2008 Springer-Verlag Berlin Heidelberg*	5%
11	Understanding Applications of Genetic Algorithms to Load Forecasting Problems	1.- Students are able to explain the Development of Improved Genetic Algorithm 2.- Students are able to explain the Application of Improved Genetic Algorithm	**Criteria:** Students are able to demonstrate and simulate the Improved Genetic Algorithm **Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, Lectures and discussions. 3x 50‘‘		**Material:** Development of Improved Genetic Algorithm, Application of Improved Genetic Algorithm **Reference:** *Devendra K. Chaturvedi, Soft Computing Techniques and its Applications in Electrical Engineering, ©2008 Springer-Verlag Berlin Heidelberg*	5%
12	- Understanding the Synergism of Genetic Algorithms and Fuzzy Systems.	1.- Students are able to explain the GA-Fuzzy System Approach. 2.- Students are able to explain congestion management using GA-Fuzzy Approach	**Criteria:** Students are able to demonstrate and simulate the GA-Fuzzy System Approach **Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, Lectures and discussions. 3x 50‘‘		**Material:** GA-Fuzzy System Approach, Congestion Management Using GA-Fuzzy Approach **Reference:** *Devendra K. Chaturvedi, Soft Computing Techniques and its Applications in Electrical Engineering, ©2008 Springer-Verlag Berlin Heidelberg*	5%

13	- Understanding the Synergism of Genetic Algorithms and Fuzzy Systems.	1.- Students are able to explain the GA-Fuzzy System Approach. 2.- Students are able to explain congestion management using GA-Fuzzy Approach	**Criteria:** Students are able to demonstrate and simulate the GA-Fuzzy System Approach **Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, Lectures and discussions. 3x 50‘‘		**Material:** GA-Fuzzy System Approach, Congestion Management Using GA-Fuzzy Approach **Reference:** *Devendra K. Chaturvedi, Soft Computing Techniques and its Applications in Electrical Engineering, ©2008 Springer-Verlag Berlin Heidelberg*	5%
14	Explaining the Integration of Neural Networks and Fuzzy Systems	1.- Students are able to explain Adaptive Neuro-Fuzzy Inference Systems 2.- Students are able to explain the constraints of ANFIS	**Criteria:** Students are able to demonstrate and simulate ANFIS **Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, Lectures and discussions. 3x 50‘‘		**Material:** Adaptive Neuro-Fuzzy Inference Systems, Constraints of ANFIS **Reference:** *Devendra K. Chaturvedi, Soft Computing Techniques and its Applications in Electrical Engineering, ©2008 Springer-Verlag Berlin Heidelberg*	5%
15	Explaining the Integration of Neural Networks and Fuzzy Systems	1.- Students are able to explain Adaptive Neuro-Fuzzy Inference Systems 2.- Students are able to explain the constraints of ANFIS	**Criteria:** Students are able to demonstrate and simulate ANFIS **Form of Assessment** : Project Results Assessment / Product Assessment	Presentations, Lectures and discussions. 3x 50‘‘		**Material:** Adaptive Neuro-Fuzzy Inference Systems, Constraints of ANFIS **Reference:** *Devendra K. Chaturvedi, Soft Computing Techniques and its Applications in Electrical Engineering, ©2008 Springer-Verlag Berlin Heidelberg*	5%

16	Implementation of UAS	Students are able to demonstrate and simulate UAS questions	**Criteria:** Students can explain the answers to UAS questions well **Form of Assessment** : Project Results Assessment / Product Assessment	3x 50'' demo and presentation		**Material:** meetings 9-15 **References:** *Devendra K. Chaturvedi, Soft Computing Techniques and its Applications in Electrical Engineering, ©2008 Springer-Verlag Berlin Heidelberg* **Material:** meetings 9-15 **References:** *Wolfgang Ertel, Introduction to Artificial Intelligence, © Springer-Verlag London Limited 2011*	20%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	10%
2.	Project Results Assessment / Product Assessment	85%
3.	Test	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.