	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
Intelligent Computing	2020102061	Compulsory Study Program Subjects	T=0	P=0	ECTS=0	6	April 10, 2023

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model	**Case Studies**

Program Learning Outcomes (PLO)

PLO study program that is charged to the course

Program Objectives (PO)

PO - 1	Students have knowledge of fuzzy logic theory, neural networks, and deep learning

PLO-PO Matrix

P.O
PO-1

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																

Short Course Description	This Intelligent Computing course discusses the theory of fuzzy logic and neural networks, where in fuzzy logic there are three components, namely fuzification, membership function and defuzzification, while in neural networks there are firing rules, pattern recognition, feedforward networks, feedback networks, network layers, perceptrons , learning process, transfer function and back propagation algorithm. MATLAB software is used for the learning process in this course. The learning activity ends with an exercise in creating artificial intelligence in a power system using fuzzy logic and neural networks using MATLAB software.

References

Main :

1. Naba A. 2009. Belajar Cepat Fuzzy Logic Menggunakan MATLAB . Yogyakarta: Penerbit Andi.
2. Anonimus. 1999. Fuzzy Logic Toolbox for use with MATLAB . Mathworks Inc.
3. Bojadziev G dan Bojadziev M. 1995. Fuzzy Sets, Fuzzy Logic, Application . Singapore: World Scientific Publishing Co Pte Ltd.
4. Keith Frankish, The Open University, Milton Keynes, William M. Ramsey, 2014, Handbook of Artificial Intelligence. Cambridge University Press

Supporters:

Supporting lecturer	Unit Three Kartini, S.T., M.T., Ph.D. Dr. Lilik Anifah, S.T., M.T. Sayyidul Aulia Alamsyah, 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	Understand the basic theory of fuzzy logic	1. Explain the definition of fuzzy logic. 2. Explain when it is necessary to use fuzzy logic. 3. Explaining the relationship between input and output in fuzzy logic. 4. Explain the difference between fuzzy and non-fuzzy.	**Criteria:** Active in discussions **Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers 2 X 50	Lectures, discussions, questions and answers	**Material:** Basic theory of Fuzzy **References:** *Bojadziev G and Bojadziev M. 1995. Fuzzy Sets, Fuzzy Logic, Application. Singapore: World Scientific Publishing Co Pte Ltd.*	5%
2	Understand fuzzyfication, membership function, rule base and defuzzyfication as part of fuzzy logic	1. Explaining fuzzyfication in fuzzy logic 2. Explaining membership functions in fuzzy logic. 3. Explaining rule base in fuzzy logic. 4. Explaining defuzzification in fuzzy logic. 5. Explain the difference between bolean logic and fuzzy logic.	**Criteria:** Active in discussions **Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers. 2 X 50	Lectures, discussions, questions and answers.	**Material:** Fuzzyfication and defuzzyfication **References:** *Bojadziev G and Bojadziev M. 1995. Fuzzy Sets, Fuzzy Logic, Application. Singapore: World Scientific Publishing Co Pte Ltd.*	5%
3	Understand fuzzyfication, membership function, rule base and defuzzyfication as part of fuzzy logic	1. Explaining fuzzyfication in fuzzy logic 2. Explaining membership functions in fuzzy logic. 3. Explaining rule base in fuzzy logic. 4. Explaining defuzzification in fuzzy logic. 5. Explain the difference between bolean logic and fuzzy logic.	**Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers. 2 X 50	Lectures, discussions, questions and answers.	**Material:** Fuzzyfication and defuzzyfication **References:** *Bojadziev G and Bojadziev M. 1995. Fuzzy Sets, Fuzzy Logic, Application. Singapore: World Scientific Publishing Co Pte Ltd.*	5%

4	Understanding the fuzzy logic toolbox in MATLAB software	1. Explaining the fuzzy logic toolbox. 2. Explains command line mode. 3. Explains GUI mode. 4. Explains simulink block mode. 5. Analyze examples of fuzzy logic using the fuzzy logic toolbox. 6. Explaining FIS Editor 7. Explaining Membership Function Editor. 8. Explain the rule editor. 9. Explaining the rule viewer and Surveillance viewer.	**Form of Assessment** : Project Results Assessment / Product Assessment	- Direct Instruction - Problem Based Learning 2 X 50	- Direct Instruction - Problem Based Learning 2x50	**Material:** Using Matlab to apply fuzzy theory **References:** *Naba A. 2009. Quickly Learn Fuzzy Logic Using MATLAB. Yogyakarta: Andi Publishers.*	10%
5	Understanding the fuzzy logic toolbox in MATLAB software	1. Explaining the fuzzy logic toolbox. 2. Explains command line mode. 3. Explains GUI mode. 4. Explains simulink block mode. 5. Analyze examples of fuzzy logic using the fuzzy logic toolbox. 6. Explaining FIS Editor 7. Explaining Membership Function Editor. 8. Explain the rule editor. 9. Explaining the rule viewer and Surveillance viewer.	**Criteria:** Able to complete assigned tasks in a timely manner **Form of Assessment** : Project Results Assessment / Product Assessment	Lectures, discussions, questions and answers 2 X 50		**Material:** Using Matlab to apply fuzzy theory **References:** *Naba A. 2009. Quickly Learn Fuzzy Logic Using MATLAB. Yogyakarta: Andi Publishers.*	5%
6	Create fuzzy logic using the fuzzy logic toolbox found in MATLAB software	1. Operating MATLAB 2. Creating a fuzzy logic model for a power system using MATLAB software.	**Criteria:** 1. Can operate the Fuzzy Logic Toolbox contained in MATLAB software 2. The output produced from MATLAB software is in accordance with what was expected **Form of Assessment** : Project Results Assessment / Product Assessment	Try directly using MATLAB 2 X 50 software		**Material:** Using Matlab to apply fuzzy theory **References:** *Naba A. 2009. Quickly Learn Fuzzy Logic Using MATLAB. Yogyakarta: Andi Publishers.*	5%

7	Create fuzzy logic using the fuzzy logic toolbox found in MATLAB software	1. Operating MATLAB 2. Creating a fuzzy logic model for a power system using MATLAB software.	**Criteria:** 1. Can operate the Fuzzy Logic Toolbox contained in MATLAB software 2. The output produced from MATLAB software is in accordance with what was expected **Form of Assessment** : Project Results Assessment / Product Assessment	Try directly using MATLAB 2 X 50 software		**Material:** Using Matlab to apply fuzzy theory **References:** *Naba A. 2009. Quickly Learn Fuzzy Logic Using MATLAB. Yogyakarta: Andi Publishers.*	5%
8	Midterm Exam. Demo or simulation of fuzzy logic implementation in electric power systems using MATLAB		**Criteria:** Can solve problems given in evaluation questions **Form of Assessment** : Project Results Assessment / Product Assessment	- Problem Based Learning 2 X 50	- Problem Based Learning	**Material:** Using Matlab to apply fuzzy theory **References:** *Naba A. 2009. Quickly Learn Fuzzy Logic Using MATLAB. Yogyakarta: Andi Publishers.*	5%
9	Able to explain artificial neural networks	Can solve surrounding problems with artificial neural networks	**Form of Assessment** : Project Results Assessment / Product Assessment	- Direct Instruction - Problem Based Learning	- Direct Instruction - Problem Based Learning	**Material:** Artificial Neural Networks **References:** *Keith Frankish, The Open University, Milton Keynes, William M. Ramsey, 2014, Handbook of Artificial Intelligence. Cambridge University Press*	5%
10	Able to explain artificial neural networks	Can solve surrounding problems with artificial neural networks	**Form of Assessment** : Project Results Assessment / Product Assessment	- Direct Instruction - Problem Based Learning	- Direct Instruction - Problem Based Learning	**Material:** Artificial Neural Networks **References:** *Keith Frankish, The Open University, Milton Keynes, William M. Ramsey, 2014, Handbook of Artificial Intelligence. Cambridge University Press*	5%

11	Able to explain supervised, unsupervised, and reinforcement learning	Can explain and differentiate supervised, unsupervised, and reinforcement learning	**Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers 2x50	Lectures, discussions, questions and answers 2x50	**Material:** Artificial Neural Networks **References:** *Keith Frankish, The Open University, Milton Keynes, William M. Ramsey, 2014, Handbook of Artificial Intelligence. Cambridge University Press*	5%
12	Able to explain the Self Organizing Map	Can solve surrounding problems with the Self Organizing Map	**Criteria:** Active in discussions **Form of Assessment** : Participatory Activities	Lectures, discussions, questions and answers 2x50	Lectures, discussions, questions and answers 2x50	**Material:** Artificial Neural Networks **References:** *Keith Frankish, The Open University, Milton Keynes, William M. Ramsey, 2014, Handbook of Artificial Intelligence. Cambridge University Press*	5%
13	Able to apply Self Organizing Map	Can solve surrounding problems with the Self Organizing Map	**Criteria:** Able to complete assigned tasks in a timely manner **Form of Assessment** : Project Results Assessment / Product Assessment	- Direct Instruction - Problem Based Learning 2x50	- Direct Instruction - Problem Based Learning 2x50	**Material:** Artificial Neural Networks **References:** *Keith Frankish, The Open University, Milton Keynes, William M. Ramsey, 2014, Handbook of Artificial Intelligence. Cambridge University Press*	10%
14	Able to understand deep learning	Able to explain deep learning		Lectures, discussions, questions and answers	Lectures, discussions, questions and answers	**Material:** Artificial Neural Networks **References:** *Keith Frankish, The Open University, Milton Keynes, William M. Ramsey, 2014, Handbook of Artificial Intelligence. Cambridge University Press*	5%

15	Able to apply deep learning	Able to use deep learning to solve local problems	**Criteria:** Able to complete assigned tasks in a timely manner **Form of Assessment** : Project Results Assessment / Product Assessment	Lectures, discussions, questions and answers		**Material:** Artificial Neural Networks **References:** *Keith Frankish, The Open University, Milton Keynes, William M. Ramsey, 2014, Handbook of Artificial Intelligence. Cambridge University Press*	10%
16	Can observe problems and use appropriate methods to solve them	Can solve problems given in evaluation questions by finding the right method to solve them	**Criteria:** Can solve problems given in evaluation questions **Form of Assessment** : Project Results Assessment / Product Assessment	- Problem Based Learning 2x50	- Problem Based Learning 2x50	**Material:** Final Semester Exam **References:** *Keith Frankish, The Open University, Milton Keynes, William M. Ramsey, 2014, Handbook of Artificial Intelligence. Cambridge University Press*	15%

Evaluation Percentage Recap: Case Study

No	Evaluation	Percentage
1.	Participatory Activities	25%
2.	Project Results Assessment / Product Assessment	75%
		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.