	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
IoT System*	2020102346	Compulsory Study Program Subjects	T=0	P=0	ECTS=0	5	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
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Learning model: Project Based Learning

Program Learning Outcomes (PLO)

PLO study program which is charged to the course

Program Objectives (PO)

PO - 1	Able to apply IoT to solve problems in the engineering field
PO - 2	Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using IoT systems

PLO-PO Matrix

P.O
PO-1
PO-2

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																

Short Course Description: Internet of Things is structured as an effort to implement learning for the Internet of Things course which aims to provide students with understanding and experience in designing IoT-based application systems. The discussion in this lecture is about building a simple IoT infrastructure starting from node devices that function as sensors and accuators, gateways as communication bridges to the internet and IoT as a platform as a provider of data storage and management services. The learning model developed is Student Centered Learning (SCL) so that students are expected to have read carefully the assignment plan and the references referred to before carrying out the learning process.

References

Main :

1. Robbins, Michael F. 2019. Ultimate Electronics: Practical Circuit Design and Analysis. CircuitLab Inc.
2. Qusay F. Hassan, Atta ur Rehman Khan, Sajjad A. Madani. 2018. Internet of Things: Challenges, Advances, and Applications. CRC Press.
3. Maneesh Rao. 2018. Internet of Things with Raspberry Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT project. Packt Publishing.

Supporters:

1. Jurnal penelitian yang relevan

Supporting lecturer: Dr. Nurhayati, S.T., M.T.
Dr. Lilik Anifah, S.T., M.T.
Parama Diptya Widayaka, S.ST., 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	Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	1.Actively searching for literature 2.Active in discussions	**Criteria:** Activeness in group discussions Individual formative test results **Form of Assessment** : Participatory Activities	Lectures and discussions 2 X 50		**Material:** Introduction to IoT **Library:** **Material:** Introduction to IoT **Reader:** *Maneesh Rao. 2018. Internet of Things with Raspberry Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects. Packt Publishing.*	5%
2	1.Able to apply IoT (monitoring and control) using the LM-35 sensor (temperature sensor) to solve problems in the engineering field 2.Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	1.The resulting project results 2.Active in discussions	**Criteria:** 1.The resulting project results 2.Ability to present projects **Form of Assessment** : Project Results Assessment / Product Assessment	Project based learning 2 X 50		**Material:** IoT (monitoring and control) using the LM-35 sensor (temperature sensor) **References:** *Qusay F. Hassan, Atta ur Rehman Khan, Sajjad A. Madani. 2018. Internet of Things: Challenges, Advances, and Applications. CRC Press.*	5%

3	1. Able to apply IoT (monitoring and control) using the LM-35 sensor (temperature sensor) to solve problems in the engineering field 2. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	1. The resulting project results 2. Active in discussions	**Criteria:** 1. The resulting project results 2. Ability to present projects **Form of Assessment** : Project Results Assessment / Product Assessment	Project based learning 2 X 50		**Material:** IoT (monitoring and control) using the LM-35 sensor (temperature sensor) **References:** **Material:** IoT (monitoring and control) using the LM-35 sensor (temperature sensor) **Reader:** *Maneesh Rao. 2018. Internet of Things with Raspberry Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects. Packt Publishing.*	5%
4	1. Able to apply IoT (monitoring and control) using the MQ2 LPG Btane sensor to solve problems in the engineering field 2. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	1. The resulting project results 2. Active in discussions	**Criteria:** 1. The resulting project results 2. Active in discussions **Form of Assessment** : Project Results Assessment / Product Assessment	Project based learning 2 X 50		**Material:** Application of IoT (monitoring and control) using the MQ2 LPG Btane sensor. **Reference:** *Qusay F. Hassan, Atta ur Rehman Khan, Sajjad A. Madani. 2018. Internet of Things: Challenges, Advances, and Applications. CRC Press.*	5%
5	1. Able to apply IoT (monitoring and control) using the MQ2 LPG Btane sensor to solve problems in the engineering field 2. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	1. The resulting project results 2. Active in discussions	**Criteria:** 1. The resulting project results 2. Active in discussions **Form of Assessment** : Project Results Assessment / Product Assessment	Project based learning 2 X 50		**Material:** Application of IoT (monitoring and control) using the HC-SR04 system sensor **. Library:** **Material:** IoT (monitoring and control) using the MQ2 LPG Btane sensor and HC-SR04 **Library:** *Relevant research journals*	5%

6	1. Able to apply IoT (monitoring and control) using the HC-SR04 system sensor (ultrasonic sensor) to solve problems in the engineering field. 2. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	1. Students' ability to apply IoT (monitoring and control) using the HC-SR04 system sensor (ultrasonic sensor) to solve problems in the engineering field. 2. Active in discussions	**Criteria:** 1. The resulting project results 2. Active in discussions **Form of Assessment** : Project Results Assessment / Product Assessment	Project based learning 2 X 50		**Material:** IoT (monitoring and control) using the HC-SR04 system sensor **Library:** **Material:** IoT (monitoring and control) using the HC-SR04 system sensor **Reader:** *Maneesh Rao. 2018. Internet of Things with Raspberry Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects. Packt Publishing.*	5%
7	1. Able to apply IoT (monitoring and control) using the HC-SR04 system sensor (ultrasonic sensor) to solve problems in the engineering field. 2. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	1. Students' ability to apply IoT (monitoring and control) using the HC-SR04 system sensor (ultrasonic sensor) to solve problems in the engineering field. 2. Active in discussions	**Criteria:** 1. The resulting project results 2. Active in discussions **Form of Assessment** : Project Results Assessment / Product Assessment	Project based learning 2 X 50		**Material:** IoT (monitoring and control) using the HC-SR04 system sensor **Library:** *Relevant research journals*	5%
8	Midterm exam	1. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors. 2. Able to apply IoT (monitoring and control) using the LM-35 sensor (temperature sensor), MQ2 LPG Btane, and ultrasonics to solve problems in the engineering field.	**Criteria:** 1. The resulting project results 2. Active in discussions **Form of Assessment** : Project Results Assessment / Product Assessment	2 X 50		**Material:** UTS in project form **Library:** *Relevant research journals*	30%

9	1. Able to apply IoT (monitoring and controlling) using the DHT11 Temperature Humidity system sensor to solve problems in the engineering field. 2. Able to apply IoT (monitoring and control) using PIR Motion to solve problems in the engineering field. 3. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	1. Students are able to apply IoT (monitoring and controlling) using the DHT11 Temperature Humidity and PIR Motion system sensors to solve problems in the engineering field. 2. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	**Criteria:** 1. The resulting project results 2. Active in discussions	Project based learning		**Material:** Application of IoT in monitoring and control processes **References:** *Qusay F. Hassan, Atta ur Rehman Khan, Sajjad A. Madani. 2018. Internet of Things: Challenges, Advances, and Applications. CRC Press.*	5%
10	1. Able to apply IoT (monitoring and controlling) using the DHT11 Temperature Humidity system sensor to solve problems in the engineering field. 2. Able to apply IoT (monitoring and control) using PIR Motion to solve problems in the engineering field. 3. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	1. Students are able to apply IoT (monitoring and controlling) using the DHT11 Temperature Humidity and PIR Motion system sensors to solve problems in the engineering field. 2. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	**Criteria:** 1. The resulting project results 2. Active in discussions	Project based learning		**Material:** Application of IoT in monitoring and control processes **Reference:** *Maneesh Rao. 2018. Internet of Things with Raspberry Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects. Packt Publishing.*	5%

11	1. Able to apply IoT (monitoring and controlling) using raindrop humidity to solve problems in the engineering field. 2. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	1. Students are able to apply IoT (monitoring and controlling) using raindrop humidity to solve problems in the engineering field. 2. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	**Criteria:** 1. The resulting project results 2. Active in discussions **Form of Assessment** : Project Results Assessment / Product Assessment	Project based learning		**Material:** Application of IoT in monitoring and control processes **References:** *Qusay F. Hassan, Atta ur Rehman Khan, Sajjad A. Madani. 2018. Internet of Things: Challenges, Advances, and Applications. CRC Press.*	5%
12	1. Able to apply IoT (monitoring and controlling) using raindrop humidity to solve problems in the engineering field. 2. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	1. Students are able to apply IoT (monitoring and controlling) using raindrop humidity to solve problems in the engineering field. 2. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	**Criteria:** 1. The resulting project results 2. Active in discussions **Form of Assessment** : Project Results Assessment / Product Assessment	Project based learning		**Material:** Application of IoT in monitoring and control processes **References:** *Qusay F. Hassan, Atta ur Rehman Khan, Sajjad A. Madani. 2018. Internet of Things: Challenges, Advances, and Applications. CRC Press.*	5%
13	1. Able to apply IoT (monitoring and control) using the Flame sensor module KY-026 to solve problems in the engineering field. 2. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	1. Students are able to apply IoT (monitoring and control) using the Flame sensor module KY-026 to solve problems in the engineering field. 2. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	**Criteria:** 1. Resulting project 2. Active in discussions **Form of Assessment** : Project Results Assessment / Product Assessment	Project based learning		**Material:** Application of IoT (monitoring and control) using the Flame sensor module KY-026 to solve problems in the engineering field. **References:** **Material:** Application of IoT in monitoring and control processes **References:** *Qusay F. Hassan, Atta ur Rehman Khan, Sajjad A. Madani. 2018. Internet of Things: Challenges, Advances, and Applications. CRC Press.*	5%

14	1. Able to apply IoT (monitoring and control) using the Flame sensor module KY-026 to solve problems in the engineering field. 2. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	1. Students are able to apply IoT (monitoring and control) using the Flame sensor module KY-026 to solve problems in the engineering field. 2. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	**Criteria:** 1. Resulting project 2. Active in discussions **Form of Assessment** : Project Results Assessment / Product Assessment	Project based learning		**Material:** Application of IoT (monitoring and control) using the Flame sensor module KY-026 to solve problems in the engineering field. **References:** **Material:** Application of IoT in monitoring and control processes **References:** *Qusay F. Hassan, Atta ur Rehman Khan, Sajjad A. Madani. 2018. Internet of Things: Challenges, Advances, and Applications. CRC Press.*	5%
15	1. Able to apply IoT using a combination of sensors to solve problems in the engineering field (both monitoring and controlling systems). 2. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	Able to apply IoT using a combination of sensors to solve problems in the engineering field (both monitoring and controlling systems). Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	**Criteria:** 1. Resulting project 2. Active in discussions.	Project based learning		**Material:** Application of IoT using a combination of sensors to solve problems in the engineering field (both monitoring and controlling systems). **References:** **Material:** Application of IoT in monitoring and control processes **References:** *Robbins, Michael F. 2019. Ultimate Electronics: Practical Circuit Design and Analysis. CircuitLab Inc.*	15%

16	1. Able to apply IoT using a combination of sensors to solve problems in the engineering field (both monitoring and controlling systems). 2. Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	Able to apply IoT using a combination of sensors to solve problems in the engineering field (both monitoring and controlling systems). Able to apply engineering principles, identify, formulate and analyze data/information to solve problems using an IoT system using a combination of sensors.	**Criteria:** 1. Resulting project 2. Active in discussions. **Form of Assessment** : Project Results Assessment / Product Assessment	Project based learning		**Material:** Application of IoT using a combination of sensors to solve problems in the engineering field (both monitoring and controlling systems). **References:**	15%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
1.	Participatory Activities	5%
2.	Project Results Assessment / Product Assessment	95%
		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** abilities in the process and student learning outcomes are specific and measurable statements that identify the abilities 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.