	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
MICROCONTROLLER	2020102299		T=0	P=0	ECTS=0	4	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	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)
	PLO-PO Matrix

	P.O

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

Short Course Description	This course is intended to provide students with theoretical and practical skills in microcontrollers. This course combines several materials that must be mastered previously, namely digital electronics, computer programming and electronic circuits. Students will be guided to understand how microcontrollers work with a practical approach using the Arduino module. Arduino is a microcontroller module with a very easy interface so it is suitable for beginners who have never used a microcontroller at all. After taking this microcontroller course, students are expected to be able to design and create microcontroller-based thematic applications.
References	**Main :**

1. Barnett, R, O'Cull, L, Cox, S. 2007. Embedded C Programming and the Atmel AVR, 2nd Edition. Delmar.
2. Andrianto, H, Darmawan, A. 2015. Arduino belajar cepat dan pemrograman. Bandung: INFORMATIKA.
3. Kadir, A. 2013. Panduan Praktis Mempelajari Aplikasi Mikrokontroler Dan Pemrogramannya Menggunakan Arduino cd, Edisi 1. Andi publisher.

	Supporters:
Supporting lecturer	L. Endah Cahya Ningrum, S.Pd., M.Pd. Parama Diptya Widayaka, S.ST., 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	Mastering microcontroller theory and practice	1. Explain the definition of a microcontroller and its functions. 2. Distinguish between microcontrollers and microprocessors. 3. Mention the types of microcontrollers on the market. 4. Mention examples of applications using microcontrollers.	**Criteria:** 1. Question 2. Very good 3. Good 4. Enough 5. Not enough 6. 1. Which applications can be created with a microcontroller? 7. Can analyze 4 applications correctly 8. Can analyze 3 applications correctly 9. Can analyze 2 applications correctly 10. Can analyze less than 2 applications correctly 11. 2. What type of component is in the image? 12. Can identify at least 7 components correctly 13. Can identify at least 5 components correctly 14. Can identify at least 3 components correctly 15. Can identify less than 3 components 16. 3. Mention other applications that you can make with a microcontroller? along with the reasons 17. Can explain at least 3 applications correctly 18. Can explain at least 2 applications correctly 19. Can explain at least 1 application correctly 20. Can't explain the app properly	Model: Problem Based Learning Method: Lecture Approach: Scientific 3 X 50			0%
2	Able to use the Arduino-UNO module.	1. Able to understand the minimum AVR system and types of modules on the market 2. Be able to name the types of Arduino modules 3. Able to connect the Arduino-Uno module to a laptop using USB 4. Able to identify pins on the Arduino-Uno module 5. Able to analyze the function of the Arduino-Uno module		Model: Problem Based Learning Method: Demonstration Approach: Scientific 3 X 50			0%

3	Able to write programs in C using Arduino IDE.	1. Able to analyze the programming structure on Arduino 2. Able to differentiate between void setup and void loop functions 3. Able to write branching programs without any errors 4. Able to write looping programs without any errors 5. Able to verify and upload programs to Arduino		Model: Problem Based Learning Method: Demonstration Approach: Scientific 3 X 50			0%
4	Able to apply digital input/output programming	1. Able to use digital output pins 2. Able to turn on and off LED lights 3. Able to use a relay module 4. Able to modify traffic light programs		Model: Problem Based Learning Method: Demonstration Approach: Scientific 3 X 50			0%
5	Able to apply digital input/output programming	1. Able to use digital input pins 2. Able to use push buttons as input 3. Able to use a light sensor module 4. Able to modify the keypad program		Model: Problem Based Learning Method: Demonstration Approach: Scientific 3 X 50			0%
6	Able to master the concept of object oriented programming (OOP)	1. Able to analyze a function in Arduino programming 2. Able to write a function 3. Able to use libraries in Arduino programming 4. Able to explain the concept of object oriented programming (OOP)		Model: Problem Based Learning Method: Lecture Approach: Scientific 3 X 50			0%
7	Able to master the concept of object oriented programming (OOP)	1. Able to analyze the writing of objects and methods 2. Able to modify the properties of an object 3. Able to use the LCD library correctly 4. Able to modify LCD programs 5. Able to use two LCDs in one programming		Model: Problem Based Learning Method: Demonstration Approach: Scientific 3 X 50			0%
8	UTS			3 X 50			0%

9	Able to create programs with serial communication	1. Able to explain the data communication system with USART 2. Able to analyze pins used in serial communication 3. Able to choose Baudrate that suits your needs 4. Able to modify serial programs		Model: Problem Based Learning Method: Demonstration Approach: Scientific 3 X 50			0%
10	Able to create programs with serial communication	1. Capable of using a 433 MHz wireless module 2. Able to use Bluetooth module 3. Able to modify serial programs for 433 MHz wireless modules 4. Able to modify serial programs for Bluetooth modules		Model: Problem Based Learning Method: Demonstration Approach: Scientific 3 X 50			0%
11	Able to create programs with Analog-to-Digital Converter (ADC)	1. Able to understand the concept of analog to digital data conversion 2. Able to show ADC pins on Arduino 3. Able to use ADC program with potentiometer 4. Able to use ADC program with LM35 temperature sensor 5. Able to modify ADC program with LM35 temperature sensor		Model: Problem Based Learning Method: Demonstration Approach: Scientific 3 X 50			0%
12	Able to create programs with Pulse Width Modulation (PWM)	1. Able to explain the concept of Pulse Width Modulation (PWM) 2. Able to show PWM pins on Arduino 3. Able to use PWM program to dimmer LED lights 4. Able to use PWM programs for motor speed control 5. Able to modify PWM programs for motor speed control		Model: Problem Based Learning Method: Demonstration Approach: Scientific 3 X 50			0%

13	Able to apply programming with I2C	1. Able to explain data communication with I2C 2. Able to show I2C pins on Arduino 3. Able to use I2C programs for LCD modules 4. Able to use I2C program for temperature sensor module 5. Able to modify I2C programs for LCD modules and temperature sensor modules		Model: Problem Based Learning Method: Demonstration Approach: Scientific 3 X 50			0%
14	Able to design and create microcontroller-based thematic applications	1. Able to design microcontroller-based thematic application systems 2. Able to identify needs for microcontroller-based thematic application systems 3. Able to realize microcontroller-based thematic application systems 4. Able to explain how microcontroller-based thematic application systems work 5. Able to demonstrate how microcontroller-based thematic application systems work		Model: Project Based Learning Method: Demonstration Approach: Scientific 3 X 50			0%
15	Able to design and create microcontroller-based thematic applications	1. Able to design microcontroller-based thematic application systems 2. Able to identify needs for microcontroller-based thematic application systems 3. Able to realize microcontroller-based thematic application systems 4. Able to explain how microcontroller-based thematic application systems work 5. Able to demonstrate how microcontroller-based thematic application systems work		Model: Project Based Learning Method: Demonstration Approach: Scientific 3 X 50			0%
16				2 X 50			0%

Evaluation Percentage Recap: Project Based Learning

No	Evaluation	Percentage
		0%

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.