	Universitas Negeri Surabaya Faculty of Engineering , Electrical Engineering Education Undergraduate Study Program	Document Code

SEMESTER LEARNING PLAN

Courses	CODE	Course Family	Credit Weight			SEMESTER	Compilation Date
Industrial Robots	8320102162		T=2	P=0	ECTS=3.18	4	July 17, 2024

AUTHORIZATION	SP Developer	Course Cluster Coordinator	Study Program Coordinator
	.....	.....	Dr. Nur Kholis, S.T., M.T.

Learning model	**Project Based Learning**

Program Learning Outcomes (PLO)

PLO study program that is charged to the course

PLO-13	Able to design circuits, devices and products in the electrical and electronics engineering expertise program (SSC3.1).

Program Objectives (PO)

PLO-PO Matrix

P.O	PLO-13

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 provides knowledge and practical experience to electrical engineering students studying electronics and regulatory systems. The industrial robot course discusses robotics theory and its applications in industry. The material that will be presented in this course includes robot sensors and actuators, robot control systems. robot manipulator, kinematics, dynamics and robot trajectory. After taking this course, students are expected to be able to understand the basic concepts of robots and robot applications in the industrial world.

References

Main :

1. Pitowarno, Endra. 2016. Robotika; Desain, Kontrol, dan Kecerdasan Buatan Edisi 1. Yogyakarta: Andi.
2. Koren, Yoran. 1985. Robotics for Engineers. McGraw-Hill.
3. Suyandhi, Taufiq Dwi Septian. 2012. Buku Pintar ROBOTIKA: Bagaimana merancang dan membuat robot sendiri. Yoyakarta: Andi

Supporters:

Supporting lecturer	Muhamad Syariffuddien Zuhrie, S.Pd., M.T. 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	Understand the basic concepts of robots and robot applications in the industrial world.	1. Understand the basic concepts of robots. 2. Know the applications of robots in industry. 3. Distinguish between humanoid robots and industrial robots. 4. Identify types of industrial robots.		Method: Discussion Approach: Scientific 2 X 50			0%
2	Using various sensors and actuators on industrial robots	Can use speed sensors (rotary encoder), gyroscope, accelerometer, proximity and ultrasonic on the robot		Method: Demonstration Approach: Scientific 2 X 50			0%
3	Using various sensors and actuators on industrial robots	Can use DC motors, stepper motors and servo motors on robots		Method: Demonstration Approach: Scientific 2 X 50			0%
4	Understanding control systems in industrial robots.	1. Understand the PID control system on line tracer robots. 2. Designing a PID control system for line tracer robots.		Method: Demonstration Approach: Scientific 2 X 50			0%
5	Understanding control systems in industrial robots.	1. Understand the PID control system on line tracer robots. 2. Designing a PID control system for line tracer robots.		Method: Demonstration Approach: Scientific 2 X 50			0%
6	Identify the parts of an industrial robot manipulator	1. Identify the parts of an industrial robot manipulator2. Differentiate the types of manipulators in industrial robots 3. Determining the number of degrees-of-freedom of industrial robot manipulators		Method: Demonstration Approach: Scientific 2 X 50			0%
7	Using kinematics equations in industrial robots	1. Understand the concept of forward kinematics and inverse kinematics2. Using the forward kinematics equation to determine the end effector point		Method: Demonstration Approach: Scientific 2 X 50			0%

8	UTS	Can design electronic control systems for line tracer robots		2 X 50			0%
9	Using kinematics equations in industrial robots	1. Use the inverse kinematics equation to determine the arm angle2. Calculating the arm angle of a 2-DoF3 robot. Using point plotter media to determine the arm angle		Method: Demonstration Approach: Scientific 2 X 50			0%
10	Using kinematics equations in industrial robots	1. Use the inverse kinematics equation to determine the arm angle2. Calculating the arm angle of a 2-DoF3 robot. Using point plotter media to determine the arm angle		Method: Demonstration Approach: Scientific 2 X 50			0%
11	Using simulation to solve kinematic equations	1. Understand writing kinematics formulas in the MATLAB2 program. Using simulation to solve forward kinematic equations3. Using simulation to solve inverse kinematic equations4. Calculate arm angles to draw triangles and circles		Method: Demonstration Approach: Scientific 2 X 50			0%
12	Using simulation to solve kinematic equations	1. Understand writing kinematics formulas in the MATLAB2 program. Using simulation to solve forward kinematic equations3. Using simulation to solve inverse kinematic equations4. Calculate arm angles to draw triangles and circles		Method: Demonstration Approach: Scientific 2 X 50			0%
13	Design and create programs to run SCARA type robots.	1. Design a program to run a SCARA type robot.2. Write initials with the SCARA robot		Method: Demonstration Approach: Scientific 2 X 50			0%
14	Design and create programs to run SCARA type robots.	1. Design a program to run a SCARA type robot.2. Write initials with the SCARA robot		Method: Demonstration Approach: Scientific 2 X 50			0%
15	Design and create programs to run SCARA type robots.	1. Design a program to run a SCARA type robot.2. Write initials with the SCARA robot		Method: Demonstration Approach: Scientific 2 X 50			0%
16	UAS	Write initials with the SCARA robot		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** 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.