**UNIVERSITAS PENDIDIKAN INDONESIA**
FACULTY OF MATHEMATICS AND NATURAL SCIENCES EDUCATION
DEPARTMENT OF PHYSICS EDUCATION
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|---|---|---|
| Module name: | Industrial Instrumentation | |
| Module level, if applicable: | Undergraduate | |
| Code: | FI502 | |
| Sub-heading, if applicable: | - | |
| Classes, if applicable: | - | |
| Semester: | 6th | |
| Module coordinator: | Ahmad Aminudin | |
| Lecturer(s): | Ahmad Aminudin | |
| Language: | Bahasa Indonesia | |
| Classification within the curriculum | Elective Courses | |
| Type of Teaching | Contact hours per week during the semester | Class Size |
| 1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and practical methods).<br>2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches)<br>3. Self-study (Practical/project) | 1 hour 40 minutes | 45 |
| Workload: | The total workload is 91 hours/5440 minutes (3.2 ECTS) per semester, consisting of 25 hour 20 minutes/1400 minutes lectures (0.82 ECTS), 28 hours/1680 minutes structured activities (0.98 ECTS) and 28 hours/1680 minutes self-study (0.98 ECTS) per week for 14 weeks, 11 hour 54 minutes/714 minutes for two exams (0.42 ECTS). | |
| Credit points: | 3.2 ECTS | |
| Pre-requisites course(s): | Digital Electronics, Algorithms and Programming, Metrology and Calibration | |

<table>
<tr><td>Course Learning Outcomes:</td><td>After taking this course the students have ability to:<br>CLO1. Describe the knowledge about manufacturing/Industry.<br>CLO2. Describe the knowledge of actuator systems and mechanical systems in industry<br>CLO3. Analyze the working principles of pneumatic and hydraulic systems in their application in industry<br>CLO4. Describe the knowledge of PLC architecture<br>CLO5. Create and analyze basic programming, timers, counters, arithmetic, master control and sequential PLC<br>CLO 6. Describe the knowledge of Robot Control with PLC and PLC Networks<br>CLO7. Analyze related installation, troubleshooting and maintenance of PLC</td></tr>
<tr><td>Content:</td><td>In this course, students will study (i) an explanation of the Industrial Instrumentation course , Introduction to Manufacturing / Industry, (ii) Actuators and Mechanics: Electromechanical actuators, fluid actuators, actuators based on active materials, bearings, pulleys, belt chain, cam and follower; (iii) Pneumatic and hydraulic elements: Compressor, Piston type and operation, Valve type, regulator, filter; (iv) Pneumatic and hydraulic applications in industry ; (v) PLC architecture: CPU, Input module, output module, Memory, Power Supply; (vi) Basic Programming: Ladder Diagrams; (vii) Timer Instructions: Basic functions of PLC timer, Timer Type and timer programming; (viii) Counter Instructions: Basic functions of PLC Counter, Counter Programming and Combined Timer-counter programming; (ix) PLC Arithmetic Instructions: Addition, subtraction, multiplication and division; (x) Skip Instructions and control master: SKIP Instructions, MC Instructions, Jump Instructions; (xi) Sequential instructions: Sequential functions, Sequential time format, sequential programming; (xii) Robot Control with PLC: Two-axis robot basics, robot sequential programming and industrial robot control; (xiii) PLC network: Industrial control network tier, PLC network communication, DCS; (xiv) PLC installation, troubleshooting and maintenance: checking, assembly, grounding, testing, wiring, protection, troubleshooting and maintenance procedures.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 – CLO7</td><td>Subject specific competences:<br>a. Assignments<br>b. Exam<br>- Mid exam<br>- Final exam</td><td><br><br>Written<br><br>Written test<br>Written test</td><td><br><br>20 %<br><br>25%<br>25%</td></tr>
<tr><td>2</td><td>CLO5, CLO7</td><td>Subject specific competences:<br>- Class Activity<br>- Project</td><td><br><br>Performance<br>Performance</td><td><br><br>10%<br>20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
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|---|---|
| Forms of media: | Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS |
| Literature: | 1. Mechatronics: Principles, Concepts and Application, Nitaigour Premchand Mahalik, (2003) Mc Graw Hill Publishing Company<br>2. Programmable Logic Controller: Principles and Applications (1998), John W. Webb, Meriil Publishing Company. New York<br>3. Industrial Electronic, Thomas E. Kissell 2000, Prentice Hall, Inc<br>4. Sensor And Actuator: Control System instrumentation, Clarence W. De Silva 2007, Tylor Francis Goup LLC |

**PLO and CLO mapping**

| | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 | PLO7 | PLO8 | PLO9 | PLO10 | PLO11 | PLO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CLO1** | | √ | | | | | | | | | | |
| **CLO2** | | √ | | | | | | | | | | |
| **CLO3** | | √ | | | | | | | | | | |
| **CLO4** | | √ | | | | | | | | | | |
| **CLO5** | | √ | | | | | | | | | | |
| **CLO6** | | √ | | | | | | | | | | |
| **CLO7** | | √ | | | | | | | | | | |