

**UNIVERSITI MALAYSIA PAHANG  
FAKULTI KEJURUTERAAN MEKANIKAL**

**TEACHING PLAN**

<b>1</b>	<b>Course Code and Name</b>	BHA 2313 Microcomputer Technology						
<b>2</b>	<b>Semester and Year Taught</b>	Semester 5 Year 3						
<b>3</b>	<b>Program Level/Category</b>	Degree/Computer						
<b>4</b>	<b>Unit</b>	3 Credits/ 6 ECTS						
<b>5</b>	<b>Prerequisite</b>	BHA 1303 Electrical and Electronics Engineering						
<b>6</b>	<b>Teaching Methods</b>	Lecture:	2 units	(2 hours X 14 weeks)				
		Tutorial:	0 unit	(0 hour X 7 weeks)				
		Laboratory:	1 unit	(2 hour X 14 weeks)				
<b>7</b>	<b>Course Synopsis</b>	This course is an introduction to PLC and microcontroller. Students are exposed to input/output PLC interface, PLC programming, input/output microcontroller interface and microcontroller programming.						
<b>8</b>	<b>Course Outcomes</b>	<p>By the end of semester, students should be able to:</p> <p>CO1: Describe the principles used in programming PLC.</p> <p>CO2: Apply the fundamental technique in PLC programming to control a basic automation system.</p> <p>CO3: Describe the principles used in programming microcontroller using C language.</p> <p>CO4: Apply the fundamental technique in microcontroller programming to control a basic automation system.</p> <p>CO5: Construct a microcomputer project in a professional manner.</p>						
<b>9</b>	<b>Assessment Methods</b>	Assessments	CO1	CO2	CO3	CO4	CO5	Distribution
		Mid Term/Examination	√	√				30%
		Quizzes	√		√			10%
		Assignments		√		√	√	20%
		Final Examination	√	√	√	√		40%
		Total						100%
<b>10</b>	<b>References</b>	<ol style="list-style-type: none"> <li>W. Bolton, Programmable Logic Control, 4th Ed.</li> <li>Fernando E. Valdes-Peres, Ramon Pallas-Aremy, Microcontroller: Fundamental and Applications.</li> </ol>						

Engineering programs must demonstrate that their students attain:

- 1) an ability to apply fundamental knowledge of mathematics, science, and mechanical engineering
- 2) an ability to design and conduct experiments for thermal, fluids and mechanical systems, as well as to analyze and interpret results
- 3) an ability to design a system, component, or process to meet desired needs include costing, manufacturability, environmental, societal, ethical, sustainability and other constraints
- 4) an ability to function as a successful team member on multi-tasking and multi-disciplinary issues
- 5) an ability to identify, formulate, and solve well-defined and open-ended mechanical engineering problems
- 6) an ability to understand and practice professional and ethical responsibilities
- 7) an ability to communicate effectively
- 8) an ability to recognize and apply knowledge to solve mechanical engineering issues in a global, economic, environmental, and societal context
- 9) an ability to recognize the needs and motivation to engage in life-long learning
- 10) an ability to apply knowledge of current and contemporary issues
- 11) an ability to use the techniques, skills, and modern engineering tools necessary for mechanical engineering practice
- 12) an ability to acquire entrepreneurship knowledge

	<b>Course Outcomes</b>	1	2	3	4	5	6	7	8	9	10	11	12
<b>CO1</b>	Describe the principles used in programming PLC using OSRAM device.	√											
<b>CO2</b>	Apply the fundamental technique in PLC programming to control a basic automation system.		√										
<b>CO3</b>	Describe the principles used in programming microcontroller using C language.									√			
<b>CO4</b>	Apply the fundamental technique in PLC programming to control a basic automation system.				√								
<b>CO5</b>	Construct a microcomputer project in a professional manner.					√							
<b>Course Outcomes Analysis</b>		√	√		√	√				√			

Week	Lesson Outcomes	CO	Bloom Taxonomy	Delivery	Assessment
	<b>1.0 Basic Microcomputer Concepts</b>				Assignment/Quiz/ Mid term examination/ Final examination
1	<ul style="list-style-type: none"> <li>Explain the microcomputer components, history and applications in automotive.</li> </ul>	1	Understanding, application	Lecture	
	<ul style="list-style-type: none"> <li>Explain the architecture of microcomputer.</li> </ul>	1	Understanding, application	Lecture	
	<ul style="list-style-type: none"> <li>Introduce programmable logic controller (PLC) and its applications.</li> </ul>	1	Understanding, application	Laboratory	
	<b>2.0 Programming a PLC</b>				
2	<ul style="list-style-type: none"> <li>Describe the working principle of PLC.</li> </ul>	1	Understanding, application	Lecture	Assignment/Quiz/ Mid term examination/ Final examination
	<ul style="list-style-type: none"> <li>Explain the basic structure of data exchange in PLC-based system.</li> </ul>	1	Application	Lecture	
	<ul style="list-style-type: none"> <li>Present the typical PLC instructions.</li> </ul>	1	Application	Laboratory	
3	<ul style="list-style-type: none"> <li>Explain the switches and relays.</li> </ul>	2	Application	Lecture	Assignment/Mid term examination/ Final examination
	<ul style="list-style-type: none"> <li>Create a simple PLC device with inputs and outputs for LEDs control problem.</li> </ul>	2	Application	Lecture	
	<ul style="list-style-type: none"> <li>Develop Ladder-Diagram and execute the PLC program.</li> </ul>	2	Application	Laboratory	
4	<ul style="list-style-type: none"> <li>Create a simple PLC device with inputs and outputs for simple conveyor belt control problem.</li> </ul>	2	Application	Lecture	
	<ul style="list-style-type: none"> <li>Build a system description for mechanical and electrical components.</li> </ul>	2	Application	Lecture	
	<ul style="list-style-type: none"> <li>Develop Ladder-Diagram and execute the PLC program.</li> </ul>	2	Application	Laboratory	
	<b>3.0 Entering and Running a PLC program</b>				

Week	Lesson Outcomes	CO	Bloom Taxonomy	Delivery	Assessment
5	<ul style="list-style-type: none"> <li>Describe PLC operating cycle.</li> </ul>	2	Understanding	Lecture	Assignment/Mid term examination/ Final examination
	<ul style="list-style-type: none"> <li>Demonstrate technique to modify a PLC program.</li> </ul>	2	Application	Lecture	
	<ul style="list-style-type: none"> <li>Develop a PLC-based system for bottle segregation.</li> </ul>	2	Application	Laboratory	
	<b>4.0 Programming a microcontroller</b>				
6	<ul style="list-style-type: none"> <li>Describe the working principle of microcontroller.</li> </ul>	3	Understanding	Lecture	Quiz/Final Exam
	<ul style="list-style-type: none"> <li>Explain the architecture of a microcontroller and pins configurations.</li> </ul>	3	Application	Lecture	
	<ul style="list-style-type: none"> <li>Demonstrate the types of microcontroller available in the market.</li> </ul>	3	Application	Laboratory	
7	<ul style="list-style-type: none"> <li>Explain the operations using hexadecimal and binary numbers</li> </ul>	3	Application	Lecture	
	<ul style="list-style-type: none"> <li><b>Demonstrate the conversion from different numbering systems</b></li> </ul>	3	Application	Laboratory	Laboratory report
	<b>5.0 Programming a microcontroller for automotive applications</b>				
8	<ul style="list-style-type: none"> <li>Program a microcontroller for digital system: traffic light control system</li> </ul>	4	Application	Lecture	Quiz/ Assignment
	<ul style="list-style-type: none"> <li>Develop a microcontroller based system using digital inputs and outputs</li> </ul>	4	Application	Laboratory	Quiz/ Assignments/Final Exam
9	<ul style="list-style-type: none"> <li>Program a microcontroller for a system with multiple sensors and actuators</li> </ul>	4	Application	Lecture	
	<ul style="list-style-type: none"> <li><b>Develop a microcontroller-based warning system for a factory.</b></li> </ul>	4	Analyzing	Laboratory	
10	<ul style="list-style-type: none"> <li>Program a microcontroller system for mechanical system</li> </ul>	4	Application	Lecture	

Week	Lesson Outcomes	CO	Bloom Taxonomy	Delivery	Assessment
11	<ul style="list-style-type: none"> <li>Develop a microcontroller based system for automated parking barrier.</li> </ul>	4	Application	Lecture	Quiz/ Assignment/ Final Exam
	<b>6.0 Construction of a microcomputer project</b>				
12	<ul style="list-style-type: none"> <li><b>Develop a system description for an automotive application of microcomputer in a team.</b></li> </ul>	5	Application	Project	Assignment
13	<ul style="list-style-type: none"> <li>Program an executable microcomputer coding</li> </ul>	5	Application	Project	Assignment
14	<ul style="list-style-type: none"> <li><b>Present the mini project in a group.</b></li> </ul>	5	Creating	Project	Assignment

Prepared by:	Checked by:	Checked by:	Approved by:
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