

RGPV (DIPLOMA WING) BHOPAL		OBE CURRICULUM FOR THE COURSE		FORMAT- <b>3</b>	Sheet No. 1/5
Branch	ELECTRICAL & ELECTRONICS ENGINEERING		Semester	5	
Course Code	512	Course Name	Control System & Industrial Automation		
<b>Course Outcome 1</b>	<b>Use control system concepts in different applications.</b>			Teach Hrs	Marks
<b>Learning Outcome E0151211</b>	Explain basic concepts of control system.(Cognitive domain)			6Hr	10 Mark
<b>Contents</b>	<ul style="list-style-type: none"> <li>Control System: Basic concept of open loop and closed loop control system and their comparison.</li> <li>Transfer function definition, Simple Mathematical problems on block diagram and signal flow graphs.</li> <li>Analogy between different systems: Mechanical, Electrical, Thermal</li> <li>Block diagram of Fan, AC, Automatic tank level control.</li> </ul>				
<b>Method of Assessment</b>	External: End semester theory examination (Pen paper test).				
<b>Learning Outcome E0151212</b>	Define various terms use in time domain analysis. (Cognitive domain)			6 Hr	10 Mark
<b>Contents</b>	<ul style="list-style-type: none"> <li>Time Domain Analysis: First and second order control System (Without mathematical treatment).</li> <li>Definition of different performance indices: delay time, rise time, peak time, percentage peak overshoot, Settling time, steady state error.</li> <li>Type-0, Type -1, type-2 system definition.</li> <li>Concept of stability: absolute stability, relative stability.</li> <li>Necessary conditions for stability.</li> </ul>				
<b>Method of Assessment</b>	Internal: Mid semester theory examination (Pen paper test)				
<b>Learning Outcome E0151213</b>	Identify type of control system used in different applications. (Psychomotor domain)			6 Hr	10 Mark
<b>Contents</b>	<ul style="list-style-type: none"> <li>To identify components used in various open loop control system and make their block diagram.</li> <li>To identify components used in various close loop control system and make their block diagram.</li> <li>To interpret function of automatic tank level control system with the help of block diagram.</li> </ul>				
<b>Method of Assessment</b>	External: Laboratory observation and viva voce.				

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Course Code	512	Course Name	Control System & Industrial Automation		
<b>Course Outcome 2</b>	<b>Make use of number systems and logic gates in digital circuits.</b>			Teach Hrs	Marks
<b>Learning Outcome E0151221</b>	Classify number systems and their conversion. (Cognitive domain)			6 Hr	10 Mark
<b>Contents</b>	<ul style="list-style-type: none"> <li>➤ Number Systems: decimal, binary, octal, hexadecimal and BCD; definition and inter-conversions.</li> <li>➤ Compliments: 1's and 2's compliment.</li> <li>➤ Binary Addition and Subtraction.</li> </ul>				
<b>Method of Assessment</b>	External: End semester theory examination (Pen paper test).				
<b>Learning Outcome E0151222</b>	Outline operation of various logic gates used in digital circuits. (Cognitive domain)			6 Hr	10 Mark
<b>Contents</b>	<ul style="list-style-type: none"> <li>➤ Logic Gates: truth tables and circuit symbols. AND, OR, NOT, NAND, NOR, X-OR, X-NOR;</li> </ul>				
<b>Method of Assessment</b>	External: End semester theory examination (Pen paper test).				
<b>Learning Outcome E0151223</b>	Verify operation of various logic gates. (Psychomotor domain)			6 Hr	10 Mark
<b>Contents</b>	<ul style="list-style-type: none"> <li>➤ To verify truth table of various logic gates.</li> </ul>				
<b>Method of Assessment</b>	External: Laboratory observation and viva voce.				

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Branch	ELECTRICAL & ELECTRONICS ENGINEERING		Semester	5	
Course Code	512	Course Name	Control System & Industrial Automation		
<b>Course Outcome 3</b>	<b>Justify the need of programmable logic controller in industrial automation.</b>			<b>Teach Hrs</b>	<b>Marks</b>
<b>Learning Outcome E0151231</b>	Compare types of industrial automation systems. (Cognitive domain)			<b>3 Hr</b>	<b>6 Mark</b>
<b>Contents</b>	<ul style="list-style-type: none"> <li>➤ Automation: Need and benefits.</li> <li>➤ Types of automation system: Fixed, Programmable, Flexible</li> <li>➤ Different systems used for Industrial automation: PLC, HMI, SCADA, DCS, Drives.</li> <li>➤ Evolution of programmable logic controller (PLC).</li> </ul>				
<b>Method of Assessment</b>	External: End semester theory examination (Pen paper test).				
<b>Learning Outcome E0151232</b>	Explain fundamental concepts of programmable logic controller. (Cognitive domain)			<b>9 Hr</b>	<b>14 Mark</b>
<b>Contents</b>	<ul style="list-style-type: none"> <li>➤ Building blocks of PLC: CPU, Memory organization, Input-output modules (discrete and analog), Specialty I/O Modules, Power supply, Fixed and Modular PLC and their types, Redundancy in PLC module.</li> <li>➤ I/O module selection criteria, Interfacing different I/O devices with appropriate I/O modules</li> <li>➤ PLC I/O addressing</li> <li>➤ PLC programming Instructions: Relay type instructions, Timer instructions: On delay, off delay, retentive.</li> <li>➤ Counter instructions: Up, Down, High speed, Logical instructions, Comparison instructions, Data handling Instructions, Arithmetic instructions.</li> </ul>				
<b>Method of Assessment</b>	External: End semester theory examination (Pen paper test).				
<b>Learning Outcome E0151233</b>	Identify various parts for given PLC. (Psychomotor domain)			<b>6 Hr</b>	<b>10 Mark</b>
<b>Contents</b>	<ul style="list-style-type: none"> <li>➤ To identify various parts of the given PLC and front panel status indicators.</li> <li>➤ Use PLC to test the START STOP logic using two inputs and one output.</li> </ul>				
<b>Method of Assessment</b>	External: Laboratory observation and viva voce.				

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Course Code	512	Course Name	Control System & Industrial Automation		
<b>Course Outcome 4</b>	<b>Utilize PLC programming for various applications.</b>			<b>Teach Hrs</b>	<b>Marks</b>
<b>Learning Outcome E0151241</b>	Make use of ladder logic for PLC programming. (Cognitive domain)			<b>6 Hr</b>	<b>10 Mark</b>
<b>Contents</b>	<ul style="list-style-type: none"> <li>➤ PLC programming language: Functional Block Diagram (FBD), Instruction List, Structured text, Sequential Function Chart (SFC), Ladder Programming.</li> <li>➤ Simple Programming examples using ladder logic: Language based on relay, timer counter,</li> <li>➤ Logical, comparison, arithmetic and data handling instructions.</li> </ul>				
<b>Method of Assessment</b>	Internal: Mid semester theory examination (Pen paper test)				
<b>Learning Outcome E0151242</b>	Use PLC for various applications. (Cognitive domain)			<b>6 Hr</b>	<b>10 Mark</b>
<b>Contents</b>	PLC Based Applications: <ul style="list-style-type: none"> <li>➤ Traffic light control, Elevator control, Tank Level control, Conveyor system.</li> <li>➤ Motor sequence control.</li> <li>➤ Stepper motor control.</li> </ul>				
<b>Method of Assessment</b>	External: End semester theory examination (Pen paper test).				
<b>Learning Outcome E0151243</b>	Develop ladder program for various applications and test it. (Psychomotor domain)			<b>6 Hr</b>	<b>10 Mark</b>
<b>Contents</b>	<ul style="list-style-type: none"> <li>➤ Develop / test the Ladder program for sequential control application of lamps/ DC motors.</li> <li>➤ Develop ladder program for Traffic light control system.</li> <li>➤ Develop / test ladder program for rotating stepper motor in forward and reverse direction at constant speed.</li> <li>➤ Develop /test ladder program for tank water level control.</li> </ul>				
<b>Method of Assessment</b>	Internal: Laboratory observation and viva voce.				

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Branch	ELECTRICAL & ELECTRONICS ENGINEERING		Semester	5	
Course Code	512	Course Name	Control System & Industrial Automation		
<b>Course Outcome 5</b>	<b>Make use of SCADA system for industrial automation.</b>			<b>Teach Hrs</b>	<b>Marks</b>
<b>Learning Outcome E0151251</b>	Explain functioning of SCADA. (Cognitive domain)			<b>6 Hr</b>	<b>10 Mark</b>
<b>Contents</b>	<ul style="list-style-type: none"> <li>➤ Introduction to SCADA: Typical SCADA architecture/block diagram, Benefits of SCADA</li> <li>➤ Various editors of SCADA</li> <li>➤ Interfacing SCADA system with PLC: Typical connection diagram, Object linking &amp; embedding for Process Control(OPC) architecture.</li> <li>➤ Steps in Creating SCADA Screen for simple object, Steps for Linking SCADA object (defining Tags and Items) with PLC ladder program using OPC.</li> </ul>				
<b>Method of Assessment</b>	External: End semester theory examination (Pen paper test).				
<b>Learning Outcome E0151252</b>	Utilize SCADA for different control application. (Cognitive domain)			<b>6 Hr</b>	<b>10 Mark</b>
<b>Contents</b>	Applications of SCADA: <ul style="list-style-type: none"> <li>➤ Traffic light control.</li> <li>➤ Water distribution.</li> <li>➤ Pipeline control.</li> </ul>				
<b>Method of Assessment</b>	Internal: Assignments/Quiz and viva voce				
<b>Learning Outcome E0151253</b>	Prepare a report on functioning of SCADA system. (Psychomotor and Affective domain)			<b>6 Hr</b>	<b>10 Mark</b>
<b>Contents</b>	<ul style="list-style-type: none"> <li>➤ To prepare a report on functioning of SCADA system by visiting a SCADA deployed place.</li> </ul>				
<b>Method of Assessment</b>	Internal: Observation and viva voce.				

**Reference Books:**

1.	Control System, Publisher: New Age International Pvt Ltd, ISBN: 9789386070111, 9789386070111	Nagrath & Gopal
2.	Linear Control Systems with MATLAB Applications, Publisher: Khanna Publishers, ISBN: 9788174093103, 9788174093103	Manke, B. S.
3	Digital Electronics, Technical Publication, Pune	Godse, A. P.
4.	Digital Design, Publisher: Prentice Hall of India Pvt. Ltd.	M. Morris Mano, Michael D. Ciletti,
5.	Digital Electronics: Principles, Devices and Applications, Publisher: Willy	Maini, A. K.
6.	Introduction to Programmable Logic Controllers, Thomson /Delmar learning, New Delhi, 2005,ISBN 13 : 9781401884260	Dunning, G.
7.	Programmable Logic Controller, Khanna publishers, New Delhi, 2017, ISBN : 9788174092281	Jadhav, V. R.
8.	Programmable Logic Controllers, McGraw Hill India, New Delhi, 2010, ISBN: 9780071067386	Petruzella, F.D.
9.	Programmable Logic Controllers, PHI Learning, New Delhi, 2003, ISBN : 9780130607188	Hackworth, John; Hackworth, Federic
10.	Industrial automation and Process control, PHI Learning, New Delhi, 2003, ISBN : 9780130618900	Stenerson Jon
11.	Programmable Logic Controllers and Industrial Automation - An introduction, Penram International Publication, 2015, ISBN: 9788187972174	Mitra, Madhuchandra; Sengupta, Samarjit,
12.	Supervisory Control and Data Acquisition, ISA Publication, USA, ISBN: 978-1936007097	Boyar, S. A.
13.	Practical SCADA for industry, Newnes (an imprint of Elsevier), UK 2003, ISBN:0750658053	Bailey David ; Wright Edwin