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| **Walchand College of Engineering, Sangli***(Government Aided Autonomous Institute)* |
| **AY 2023-24** |
| **Course Information** |
| **Programme** | B. Tech. (Mechanical Engineering) |
| **Class, Semester** | Final Year B. Tech., Sem. VII |
| **Course Code** | 5OE429 |
| **Course Name**  | Industrial Automation  |
| **Desired Requisites:** |  |
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| **Teaching Scheme** | **Examination Scheme (Marks)** |
| **Lecture** | 3Hrs/week | **MSE** | **ISE** | **ESE** | **Total** |
| **Tutorial** | - | 30 | 20 | 50 | 100 |
|  |  | **Credits: 3** |
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| **Course Objectives** |
| **1** | To train the students in the area of instrumentation, automation and control. |
|   **2** | To get the basic knowledge and practical experience in instrumentation, automation and control area and to work more effectively in manufacturing, process and automation industries |
|  **3** | To get the knowledge of various elements of industrial automation – CAD/CAM, sensors, pneumatics, hydraulics and CNC. |
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| **Course Outcomes (CO) with Bloom’s Taxonomy Level** |
| At the end of the course, the students will be able to, |
| **CO** | **Course Outcome Statement/s** | **Bloom’s Taxonomy Level** | **Bloom’s Taxonomy Description** |
| **CO1** | Identify different types automation, technological and economic issues involved in automatic manufacturing of products | III | Apply |
| **CO2** | Interpret basic concepts of sensors and transducers into real world applications. | V | Evaluate |
| **CO3** | Classify the major components used in automation such as commonly used sensors and analyze common techniques for sensor interfacing and protection circuits | IV | Analyze |
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| **Module** | **Module Contents** | **Hours** |
| I | **Introduction to Automation** Introduction: Reason of automation, Current trends, classification and types of automation, Application of automation, Goals of automation, Low cost automation, Current emphases in automation, Issues for automation in factory operation, Ten strategies for automation. | 6 |
| II | **NC and CNC** Rigid automation: Part handling, Machine tools. Flexible automation: Computer control of Machine Tools and Machining Centres, NC and NC part programming, CNC-Adaptive Control, Automated Material handling. Assembly, Flexible fixturing. | 6 |
| III | **Computer Aided design**Computer Aided Design: Fundamentals of CAD - Hardware in CAD-Computer Graphics Software and Data Base, Geometric modeling for downstream applications and analysis methods; Computer Aided Manufacturing: CNC technology, CNC Adaptive Control | 7 |
| IV | **Automation Elements**Low cost automation: Mechanical & Electro mechanical Systems, Pneumatics and Hydraulics, Illustrative Examples and case studies. | 7 |
| V | **Sensors and Processors**  Introduction, Sensor and transducers, Sensor technology, Selection of Transducers, Classification of sensors and transducers, History of Microprocessor, Programmable logic controller, Working of PLC. | 7 |
| VI | **Modelling and Simulation** Introduction to Modelling and Simulation: Product design, process route modelling, Optimization techniques, Case studies & industrial applications | 6 |
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| **Text Books** |
| 1 | Mikell P. Groover, “Automation, Production systems and computer integrated manufacturing”, Prentice Hall, 5th edition, 2019. |
| 2 | Serope Kalpakjain and Steven R. Schmid, “Manufacturing Engineering and Technology”, 7th edition, Pearson, 2014. |
| 3 | Ibrahim Zeid, CAD/CAM : Theory & Practice, 6th edition, 25 June 2009. |
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| **References** |
| 1 | Yoram Koren, “Computer control of manufacturing system”, McGraw Hill, 1st edition, 2017 |
| 2 | Webb and Reis, “Programmable Logic Controller – Principles and Applications”, Prentice Hall of India, 5th Edition, 2002 |
| 3 | Kolk R.A. and Shetty Devdas, “Mechatronics System Design”, Thomson Learning, 2007, 3rd Edition |
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| **Useful Links** |
| 1 | https://nptel.ac.in/courses/112/103/112103293/ |
| 2 | https://onlinecourses.nptel.ac.in/noc20\_me58/preview |
| 3 | https://nptel.ac.in/courses/112/104/112104288/ |
| 4 | https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-me58/ |

**Civil**

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| **CO-PO Mapping** |
|  | **Programme Outcomes (PO)** | **PSO** |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |  |
| **CO1** | 2 |  |  |  | 1 | 1 |  |  |  |  |  |  |  |  |  |
| **CO2** | 2 | 1 |  |  | 2 |  | 1 |  | 1 |  |  | 1 |  |  |  |
| **CO3** | 2 | 1 | 2 |  | 1 |  |  |  |  |  |  | 1 |  |  |  |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High |

**Electronics**

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| **CO-PO Mapping** |
|  | **Programme Outcomes (PO)** | **PSO** |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |  |
| **CO1** | 2 |  | 1 |  | 1 |  |  |  |  |  |  |  |  |  |  |
| **CO2** | 2 | 2 |  |  | 2 |  |  |  |  |  |  | 1 |  |  |  |
| **CO3** | 2 | 2 | 1 |  | 1 |  | 1 |  |  |  |  | 1 |  |  |  |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High |

**Electrical**

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| **CO-PO Mapping** |
|  | **Programme Outcomes (PO)** | **PSO** |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |  |
| **CO1** | 2 |  | 1 | 1 |  |  |  |  |  |  |  |  |  |  |  |
| **CO2** | 2 | 1 |  |  | 1 |  | 1 |  |  |  |  | 1 |  |  |  |
| **CO3** | 2 | 1 | 2 |  | 1 |  |  |  |  |  |  | 1 |  |  |  |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High |

**Computer Science**

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| **CO-PO Mapping** |
|  | **Programme Outcomes (PO)** | **PSO** |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |  |
| **CO1** | 2 | 1 |  |  | 1 | 1 |  |  |  |  |  |  |  |  |  |
| **CO2** | 2 | 1 |  |  | 2 |  |  |  | 2 |  |  | 1 |  |  |  |
| **CO3** | 2 | 2 | 2 |  | 1 |  |  |  |  |  |  | 1 |  |  |  |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High |

**Information Technology**

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| **CO-PO Mapping** |
|  | **Programme Outcomes (PO)** | **PSO** |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 |  |
| **CO1** | 2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **CO2** | 2 | 1 |  | 1 | 1 |  |  |  | 1 |  |  | 1 |  |  |  |
| **CO3** | 2 | 1 | 2 |  | 1 |  |  |  | 1 |  |  | 1 |  |  |  |
| The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High |

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| **Assessment**  |
| The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3.ISE shall be taken throughout the semester in the form of teacher’s assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)  |