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| **Walchand College of Engineering, Sangli**  *(Government Aided Autonomous Institute)* | | | | | | | | | |
| **AY 2023-24** | | | | | | | | | |
| **Course Information** | | | | | | | | | |
| **Programme** | | | | B.Tech. (Electronics Engineering) | | | | | |
| **Class, Semester** | | | | Third Year B. Tech., Sem VI | | | | | |
| **Course Code** | | | | 6OE364 | | | | | |
| **Course Name** | | | | Cyber Physical Systems | | | | | |
| **Desired Requisites:** | | | |  | | | | | |
|  | | | | | | | | | |
| **Teaching Scheme** | | | | **Examination Scheme (Marks)** | | | | | |
| **Lecture** | | | 3 Hrs/week | **MSE** | **ISE** | **ESE** | | **Total** | |
| **Tutorial** | | | - | 30 | 20 | 50 | | 100 | |
|  | | |  | **Credits: 3** | | | | | |
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| **Course Objectives** | | | | | | | | | |
| **1** | To illustrate the fundamental concepts of Cyber Physical Systems | | | | | | | | |
| **2** | To explain design of Cyber Physical Systems. | | | | | | | | |
| **3** | To enable the students for the design and development of CPS | | | | | | | | |
| **4** |  | | | | | | | | |
| **Course Outcomes (CO) with Bloom’s Taxonomy Level** | | | | | | | | | |
| At the end of the course, the students will be able to, | | | | | | | | | |
| **CO1** | Explain fundamentals and components of CPS | | | | | | Understand | | |
| **CO2** | Analyze the components of CPS | | | | | | Analyze | | |
| **CO3** | Design the CPS Systems for given Applications | | | | | | Create | | |
| **CO4** |  | | | | | |  | | |
|  | | | | | | | | | |
| **Module** | | **Module Contents** | | | | | | | **Hours** |
| I | | **Introduction**  Introduction of Cyber Physical Systems, various components of CPS, Applications of Cyber Physical System, Design aspects of Cyber Physical system, Introduction to Real Time System | | | | | | | 7 |
| II | | **Sensing**  Types of sensors, Classifications of sensors, Different selection criteria of sensors, Sensor Instrumentation, Concept of Smart sensors, Wireless sensors | | | | | | | 8 |
| III | | **Sensor Network and Protocol**  Sensor Network, Wireless Sensor Network, working of WSN, routing in wireless sensor network, Gateway functions, Data Aggregations, design issues of WSN Short distance protocols : Bluetooth, BLE ( Bluetooth Smart ), Zigbee, and Industrial protocol Modbus, Mbus, 6LoWPAN, IEC68XX | | | | | | | 5 |
| IV | | **Embedded system computing**  Introduction to Embedded system, Architecture, Programming aspects, peripherals and system design | | | | | | | 7 |
| V | | **CPS Security**  CPS security, Holistic Approach to Security, Overview of Security Technologies  Principal security requirements,Security Issues, Types of attacks to CPS. | | | | | | | 5 |
| VI | | **CASE Study**  Industry Automation, Smart Grid, SCADA, general case study of any CPS. | | | | | | | 8 |
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| **Textbooks** | | | | | | | | | |
| 1 | | Olivier Hersent, David B. Omer Elloumi, “The Internet of Things key applications and  Protocols”, Wiley publications | | | | | | | |
| 2 | |  | | | | | | | |
| 3 | |  | | | | | | | |
| 4 | |  | | | | | | | |
|  | | | | | | | | | |
| **References** | | | | | | | | | |
| 1 | | Lars T Berger K Iniewski, “Smart Grid Applications, Communications, and Security”, Wiley Publications | | | | | | | |
| 2 | |  | | | | | | | |
| 3 | |  | | | | | | | |
| 4 | |  | | | | | | | |
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| **Useful Links** | | | | | | | | | |
| 1 | | http://www.cyphylab.ee.ucla.edu | | | | | | | |
| 2 | |  | | | | | | | |
| 3 | |  | | | | | | | |
| 4 | |  | | | | | | | |

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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 |  |  |  |  |  |  |  |  |  |  |  |  |
| **CO3** |  |  |  | 3 |  |  |  |  |  |  |  |  |  |  |
| **CO4** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| The strength of mapping is to be written as 1: Low, 2: Medium, 3: High  Each CO of the course must map to at least one PO. | | | | | | | | | | | | | | |

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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) |