# DEPARTMENT MECHANICAL ENGINEERING

## LESSON PLAN

| Course Code | Course Title | Semester | Branches | Contact Periods /Week | Academic Year | Date of commencement of Semester |
|---|---|---|---|---|---|---|
| 20RB5T02 | Internet of Things | V | ROBOTICS | 05 | 2024-25 | 05-06-2024 |

**COURSE OUTCOMES**

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|---|---|
| 1 | Summarize the basic principles, physical and logical design, functional blocks, communication systems and API of IoT systems. [K2] |
| 2 | Differentiate between IoT and M2M technologies, explain the concepts of Software Defined Networks (SDN) and Network Virtualization. [K2] |
| 3 | Describe hardware components used for computing, communicating, sensing, actuation, I/O interfaces in IoT. [K2] |
| 4 | Summarize the applications of IoT through various case studies. [K2] |
| 5 | Explain the concepts of IIoT and Industry 4.0, their requirements and benefits [K3] |

| UNIT | Outcomes / Bloom's Level | Topics No. | Topics/Activity | Text Book / Reference | Contact Hour | Delivery Method |
|---|---|---|---|---|---|---|
| | | | **INTRODUCTION TO IOT** | | | |
| I | Summarize the basic principles, physical and logical design, functional blocks, communication systems and API of IoT systems. [K2] | 1.1 | Introduction to IOT, Definition & Applications of IoT | T1,T3, R1 | 1 | Chalk & Talk PPT, PBL |
| | | 1.2 | Characteristics of IoT | T1,T3 | 1 | |
| | | 1.3 | Physical design of IoT: Things in IOT | T1,T3 | 1 | |
| | | 1.3.1 | IOT Protocols: Link Layer | T1,T3 | 1 | |
| | | 1.3.2 | Network Layer, Transport Layer | T1,T3 | 1 | |
| | | 1.3.3 | Application Layer | T1,T3 | 1 | |
| | | 1.4 | logical design of IoT, Functional blocks of IoT | T3 | 1 | |
| | | 1.4.1 | IOT communication models: Request response | T3 | 1 | |
| | | 1.4.1.1 | Public subscribe communication model | T3 | 1 | |
| | | 1.4.1.2 | Push pull & Exclusive pair communication model | T3 | 1 | |

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|---|---|---|---|---|---|---|
| | | 1.4.2 | IOT Communication APIs: REST based | T3 | 1 | |
| | | 1.4.2.1 | Web Socket based Communication APIs | T3 | 1 | |
| | | | | **Total** | **12** | |
| **IOT & M2M** | | | | | | |
| **II** | **Differentiate between IoT and M2M technologies, explain the concepts of Software Defined Networks (SDN) and Network Virtualization. [K2]** | 2.1 | Introduction to Machine to Machine (M2M) | T3 | 1 | Chalk & Talk PPT,Flipped class |
| | | 2.1.1 | M2M system architecture | T3 | 1 | |
| | | 2.1.2 | M2M Gateway | T3 | 1 | |
| | | 2.1.3 | Difference between M2M and IOT | T3 | 1 | |
| | | 2.2 | IOT components | T3 | 1 | |
| | | 2.3 | IOT Levels and IOT cloud components | T3 | 1 | |
| | | 2.4 | Conventional Network Architecture | T3 | 1 | |
| | | 2.5 | Software Defined Networking (SDN): Architecture | T2,T3 | 1 | |
| | | 2.5.1 | SDN Layers | T2,T3 | 1 | |
| | | 2.5.2 | Key Elements of SDN | T2,T3 | 1 | |
| | | 2.5.2.1 | Open Flow switch | T2,T3 | 1 | |
| | | 2.6 | Network Function Virtualization (NFV) | T2,T3 | 1 | |
| | | 2.6.1 | NFV Architecture, Key Elements of NFV | T2,T3 | 1 | |
| | | 2.6.2 | Home network with home gateway and virtualized gateway | T3 | 1 | |
| | | | | **TOTAL** | **13** | |
| **ELEMENTS OF IOT** | | | | | | |
| **III** | **Describe hardware components used for computing, communicating, sensing, actuation, I/O interfaces in IoT. [K2]** | 3.1 | Introduction of hardware used in IoT | T1,T3 | 1 | Chalk & Talk PPT, PBL |
| | | 3.2.1 | Computing hardware-Raspberry Pi board components | T1,T3 | 1 | |
| | | 3.2.2 | Arduino Uno board components | T1,T3 | 1 | |
| | | 3.3 | Sensing, Sensor functions and types. | T1,T3, R2 | 1 | |
| | | 3.4.1 | Sensors used in IoT- Humidity and Temperature sensor | T1,T3 | 1 | |
| | | 3.4.2 | Color sensor, Raindrop sensor | T1,T3 | 1 | |
| | | 3.4.3 | Flame and gas sensors, Ultrasonic distance measurement sensor | T1,T3 | 1 | |
| | | 3.5 | Actuation, Actuator-characteristics | T1,T3 | 1 | |

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| | | 3.6.1 | Actuator types, Hydraulic actuators | T1,T3 | 1 | |
| | | 3.6.2 | Pneumatic, thermal and electric actuators | T1,T3 | 1 | |
| | | 3.6.3 | Mechanical actuators, Shape memory Polymers | T1,T3 | 1 | |
| | | 3.7 | Communication devices | T1,T3, R2 | 1 | |
| | | 3.8 | Input/Output interfaces, GPIO Pins, UART, SPI, I2C,USB | T1,T3 | 1 | |
| | | | | **Total** | **13** | |
| **IOT CASE STUDIES** | | | | | | |
| **IV** | **Summarize the applications of IoT through various case studies. [K2]** | 4.1 | Industrial Automation - Machine Diagnosis and Prognosis | T3 | 1 | Chalk & Talk, PBL |
| | | 4.2 | Real time monitoring of Assembly line production | T3 | 1 | |
| | | 4.3 | Hazardous gas leakage detection | T3 | 1 | |
| | | 4.4 | Indoor air quality Monitoring-Case study | T3 | 1 | |
| | | 4.5 | Crime assistance in a smart IoT transportation system | T3,R3 | 1 | |
| | | 4.6 | Home automation- Smart Lighting | T3,R2 | 1 | |
| | | 4.7 | Home Intrusion Detection | T3 | 1 | |
| | | 4.8 | Agricultural IoT- Smart irrigation management system | T3 | 1 | |
| | | 4.9 | Green house Control | T3 | 1 | |
| | | 4.10 | Healthcare IoT | T1,T3 | 1 | |
| | | 4.11 | Smart Parking | T3 | 1 | |
| | | 4.12 | Weather monitoring system | T3 | 1 | |
| | | | | **Total** | **12** | |
| **INDUSTRIAL INTERNET OF THINGS (IIOT)** | | | | | | |
| **V** | **Explain the concepts of IIoT and Industry 4.0, their requirements and benefits [K2]** | 5.1 | Key IIOT technologies | T2,R1 | 1 | Chalk & Talk, PPT |
| | | 5.2 | Catalysts and precursors of the IIOT | T2 | 1 | |
| | | 5.3 | Innovation and the IIOT | T2 | 1 | |
| | | 5.4 | Intelligent devices | T2 | 1 | |
| | | 5.5 | Key opportunities and benefits | T2 | 1 | |
| | | 5.6.1 | Industry 4.0 - definition | T2,R1 | | |
| | | 5.6.2 | Four main characteristics of Industry 4.0 | T2,R1 | 1 | |
| | | 5.6.3 | Design principles | T2 | 1 | |

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| | | 5.6.4 | Building blocks | T2 | 1 | |
| | | 5.6.5 | Smart manufacturing | T2 | 1 | |
| | | | | **Total** | **10** | |
| **CUMULATIVE PROPOSED PERIODS** | | | | | **60** | |

**Text Books:**

| S.No. | AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION |
|---|---|
| T1 | Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram, Internet of Things, 2nd edition, Wiley, 2019 |
| T2 | Alasdair Gilchrist, Industry 4.0: The Industrial Internet of Things, 1st edition,A press, 2017. |
| T3 | Arsheep Bahga, Vijay Madisetti, Internet of Things: A Hands-On Approach Paperback, 1st Edition, Orient Black swan Private Limited, 2015. |

**Reference Books:**

| S.No. | AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION |
|---|---|
| R1 | Dimitrios Serpanos, Marilyn Wolf, "Internet-of-Things (IoT) Systems: Architectures, Algorithms, Methodologies", 1st Edition, Springer, 2018. |
| R2 | Marco Schwartz, Internet of Things with Arduino Cookbook, Packt Publishing Limited, 2016 |
| R3 | Rajkumar Buyya, Amir Vahid Dastjerdi, Internet of Things: Principles and Paradigms, 1st edition, Morgan Kaufmann, 2016 |
| R4 | Dieter Uckelmann, Mark Harrison, Florian Michahelles, Architecting the Internet of Things, Springer, 2011. |

**Web Details**

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| 1 | https://archive.nptel.ac.in/courses/106/105/106105166/ |
| 2 | https://www.tutorialspoint.com/internet_of_things/internet_of_things_tutorial.pdf |

| SNO | Details | Name | Signature |
|---|---|---|---|
| i. | Faculty | Mr. B. Mahesh Krishna | |
| ii. | Course Coordinator | Mr. B. Mahesh Krishna | |
| iii. | Module Coordinator | Dr. M Francis Luther King | |
| iv. | Programme Coordinator | Dr. A Gopichand | |

PRINCIPAL