

Progressive Education Society's  
**Modern College of Arts, Science and Commerce, (Autonomous)**  
**Shivajinagar, Pune – 5**  
**Third Year of B.Sc. (Computer Science) Electronics (NEP 2023)**

**SEMESTER VI**

**Code:** 23CsEleU6301

**Course Name:** Advanced Communication and IoT Based Instrumentation

Teaching Scheme: TH: 2 hrs / Week

Credit : 02

Examination Scheme: CIA: 20 Marks

End-Sem: 30 Marks

**Prerequisite Courses:**

- Basic knowledge of Electronics Communication
- Knowledge regarding basics of sensors, transducers and actuators.

**Course Objectives:**

- To study concept of wireless communication.
- To learn the concepts of cellular telephony.
- To learn the IoT basics and its architecture.
- To learn the application areas of IoT.

**Course Outcomes:** On completion of the course, student will be able to

- Describe the principles and components of advanced communication systems
- Develop the ability to understand of different wireless technologies used in IoT implementation.
- Understand the IoT architecture and different protocols used in IoT.
- Understand the concept of cloud computing.
- Get acquainted with various applications of IoT.

| <b>Advanced Communication And IoT Based Instrumentation</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |    |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| Unit 1                                                      | <b>Cellular Technology</b><br>Overview of wireless communication, Introduction to cellular telephony system: Frequency reuse, handoff strategies, Co-channel and adjacent channel interference, Block diagram of mobile transceiver, Overview of Cellular Telephony generations: 1G to 4G, 3G (W-CDMA, UMTS), 4G (LTE) Cellular technologies: GSM: architecture, frame structure, mobility management, GPRS : architecture, application, introduction to 5G technology ( Architecture, Features and Applications) | 8  |
| Unit 2                                                      | <b>Wireless Technologies</b><br>Bluetooth: Bluetooth architecture, Bluetooth protocol stack, Bluetooth frame structure Zigbee: Architecture, topologies, Applications, Z wave: Protocol architecture, applications RFID: working of RFID system, types of RFID tags, RFID frequencies, applications. Li-Fi: Architecture and applications.                                                                                                                                                                        | 6  |
| Unit 3                                                      | <b>IoT Architecture</b><br>Introduction to IoT, Evolution of IoT, M2M and IoT ,Seven layer architecture of IoT, Role of cloud in IoT, cloud topologies, Cloud                                                                                                                                                                                                                                                                                                                                                     | 10 |

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|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|        | <p>access and cloud service providers(Amazon Web Service (AWS), Microsoft Azure, Google cloud platform, IBM cloud services, Adobe Creative Cloud), Protocols in IoT, Cross connectivity across IoT system components: Device to Gateway-short range Wireless: cell phone as gateway, dedicated wireless Access points , Gateway to cloud: Long range connectivity, (wired, cellular, Satellite, WAN) , Direct Device to Cloud connectivity.</p> <p>Wireless Communication and Networking: Personal Area Network (PAN)- Bluetooth, ZigBee, Z-wave ,wireless sensor network ,RFID, NFC. Local area network: wi-fi and wiMAX.</p> <p>Wide area network: LoRaWAN , Global network: Satellite networks.</p> |   |
| Unit 4 | <p><b>IoT Edge Computing for Data Analytics &amp; Case Studies</b></p> <p>Review of cloud computing IoT, Edge/Fog Computing, Fog computing architecture, Comparison between cloud and fog, The IoT Edge Data Analytics: Real Cases, IoT Data Analytics: Types</p> <p>Interfacing IoT devices with big data and machine learning.</p> <p>IoT Applications: Smart Agriculture, Hospital Model/e-Health, wearable devices.</p>                                                                                                                                                                                                                                                                            | 6 |

## References

1. The Era of Internet of Things towards Smart Things – Khaled Salah Mohamed, Springer Publication (online Edition 2019)
2. Internet of Things with Raspberry Pi and Arduino- Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh, And Mahendra Swain- CRC press Taylor & Francis Group.
3. Wireless Communications Principles and Practice, Rappaport, PHI publication, Second Edition.
4. Internet of Things: Principles and Paradigms, Rajkumar Buyya and Dastjerdi, MK Publishers, 2016 Edition.
5. Internet of Things, Mayur Ramgir, Pearson publication, 2019 Edition.
6. Communication Electronics: Principles and Applications. L.E.Frenzel 4th Edition
7. 5G mobile and wireless communication technology , afif s seiran, Josef Monserrat, Patrick Marsch, Cambridge University Press, 2016 Edition.

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**SEMESTER VI**

**Code:** 23CsEleU6301 **Course Name:** Lab Course on Advanced Communication and IoT Based Instrumentation.

Teaching Scheme: TH: 2 hrs / Week    Credit: 02  
Examination Scheme: CIA: 20 Marks    End-Sem: 30 Marks

**Prerequisite Courses:**

- Basic knowledge of Electronics Communication
- Knowledge regarding basics of sensors, transducers and actuators.

**Course Objectives:**

- To study concept of wireless communication.
- To learn the concepts of cellular telephony.
- To learn the IoT basics and its architecture.
- To learn the application areas of IoT.

**Course Outcomes:** On completion of the course, student will be able to

- Understand the Raspberry Pi and it interfacing.
- Understand the basics of different wireless technologies used in IoT implementation.
- Interface the different sensors with Raspberry Pi.
- Understand the programming language – Python.
- Write and execute the different programmes using Python.

**List of the Experiments (Any 15 experiments form the following list)**

1. Study of GSM
2. Study of ZigBee and ZigBee Network
3. Study of LoRA interfacing
4. Study of RFID
5. LED switching using mobile
6. Interfacing PIR sensor to Raspberry Pi
7. LCD interfacing to Raspberry Pi.
8. Interfacing temperature sensor to Raspberry Pi.
9. Interfacing ultrasonic sensor to Raspberry Pi.
10. Interfacing LDR to Raspberry Pi.
11. Interfacing stepper motor to Raspberry Pi.
12. DHT 11 interfacing to Raspberry Pi
13. Arithmetic operations using Python
14. Find number of digits in the number using Python.
15. Calculation of mean, variance , standard deviation of given data
16. Plot graph for given observation table using Python/GNU plot.