Internet of Things

EG3202CT

Year: III **Total: 7 hours /week**

Part: II **Lecture: 3 hours/week**

Tutorial: 1 hours/week

Practical: hours/week

Lab: 3 hours/week

Course description:

This course provides theoretical as well as practical knowledge of fundamentals of Internet of Things to make students capable of designing, implementing and managing the issues of IOT in their personal as well professional life.

Course objectives:

After completion of this course students will be able to:

1. Design and implement fundamentals of IoT.
2. Manage privacy and security issues related to IoT.

Course Contents:

Theory

Unit 1. Introduction **[6 Hrs.]**

1.1. Definition
1.2. History of IoT
1.3. IoT Architecture
1.4. IoT Frameworks
1.5. Benefits of IoT
1.6. Applications of IoT

Unit 2. Fundamental Mechanisms and Key Technologies **[8 Hrs.]**

2.1. Identification of IoT Objects and Services
2.2. Structural Aspects of the IoT
2.3. Environment Characteristics
2.4. Traffic Characteristics
2.5. Scalability
2.6. Interoperability
2.7. Security and Privacy
2.8. Open Architecture
2.9. Key IoT Technologies
2.10. Device Intelligence
2.11. Communication Capabilities
2.12. Mobility Support
2.13. Device Power
2.14. Sensor Technology
2.15. RFID Technology
2.16. Satellite Technology

Unit 3. IoT Protocols **[6 Hrs.]**

3.1. Protocol Standardization for IoT
3.2. Efforts
3.3. M2M and WSN Protocols
3.4. SCADA and RFID Protocols
3.5. Unified Data Standards – Protocols

3.6. IEEE 802.15.4
3.7. BACNet Protocol
3.8. Modbus
3.9. Zigbee Architecture
3.10. Network layer
3.11. LowPAN
3.12. CoAP
3.13. Security

Unit 4. IoT with RASPBERRY PI [9 Hrs.]

4.1. Building IOT with RASPERRY PI
4.2. IoT Systems
4.3. Logical Design using Python
4.4. IoT Physical Devices & Endpoints
4.5. IoT Devices
4.6. Building blocks
4.7. Raspberry Pi -Board
4.8. Linux on Raspberry Pi
4.9. Raspberry Pi Interfaces
4.10. Programming Raspberry Pi with Python

Unit 5. IoT Privacy, Security and Governance [6 Hrs.]

5.1. Vulnerabilities of IoT
5.2. Security requirements
5.3. Threat analysis
5.4. Use cases and misuse cases
5.5. IoT security tomography and layered attacker model
5.6. Identity establishment
5.7. Access control
5.8. Message integrity
5.9. Non-repudiation and availability
5.10. Security model for IoT

Unit 6. Real-world applications and case studies [10 Hrs.]

6.1. Real world design constraints and challenges
6.2. Applications and Asset management
6.3. Industrial automation
6.4. Smart Metering Advanced Metering Infrastructure
6.5. Smart grid
6.6. e-Health Body Area Networks
6.7. Commercial building automation
6.8. Smart cities - participatory sensing
6.9. Data Analytics for IoT
6.10. Software & Management Tools for IoT
6.11. Cloud Storage Models & Communication
6.12. APIs
6.13. Cloud for IoT
6.14. Amazon Web Services for IoT

Practical: [45 Hrs.]

1. To Implement the IoT Frameworks

2. To Implement Cloud Storage Models & Communication
3. Interfacing sensors to Raspberry
4. Interfacing Arduino to Bluetooth Module
5. Communicate between Arduino and Raspberry PI using any wireless medium
6. To Design an IOT based system

Final written exam evaluation scheme			
Unit	**Title**	**Hours**	**Marks Distribution***
1	Introduction	6	11
2	Fundamental Mechanisms and Key Technologies	8	14
3	IoT Protocols	6	11
4	IoT with RASPBERRY PI	9	15
5	IoT Privacy, Security and Governance	6	11
6	Real-world applications and case studies	10	18
	Total	**45**	**80**

* There may be minor deviation in marks distribution.

References:

1. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications
2. ArshdeepBahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015
3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011. 3.
4. Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press, 2012.
5. Jan Ho¨ ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
6. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012
7. HakimaChaouchi, “ The Internet of Things Connecting Objects to the Web” ISBN : 978-1- 84821-140-7, Willy Publications
8. Daniel Kellmereit, Daniel Obodovski, “The Silent Intelligence: The Internet of Things”,. Publisher: Lightning Source Inc; 1 edition (15 April 2014). ISBN-10: 0989973700, ISBN-13: 978- 0989973700. 4. Fang Zhaho, Leonidas Guibas, “Wireless Sensor Network: An information processing approach”, Elsevier, ISBN: 978-81-8147-642-5.