

COURSE SYLLABUS**Name of the Group:** *Embedded System Group***Name of the Course:** *Certificate Course on Cyber Physical Systems & IoT***Course Code:** *ED504***Starting Date:** *18th November 2019***Duration:** *3 Weeks (105 Hours)***Course Description**

CPS are systems-of-systems that tightly couple their cyber (i.e. computation, communication and control), and physical components (sensing and actuation) in the context of applications such as (but not limited to): automotive and transportation, manufacturing, power distribution grid, medical and healthcare, robotics, civil infrastructure, avionics, etc. Thus, these Cyber-physical Systems utilize knowledge from the fields of embedded systems, networking, sensors, real-time systems and control as well as domain-specific knowledge to realize systems that are of untapped complexity and scale.

Internet of Things (IoT) is the interconnection of uniquely identifiable embedded computing devices within the existing Internet infrastructure. Typically, IoT is expected to offer advanced connectivity of devices, systems, and services that covers a variety of protocols, domains, and applications. The Internet of Things (IoT, sometimes Internet of Everything) is the network of physical objects or "things" embedded with electronics, software, sensors and connectivity to enable it to achieve greater value and service by exchanging data with the manufacturer, operator and/or other connected devices. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure.

The participants of this module will learn about IoT Architecture, IoT platform, wireless sensor networks and IoT Application development.

Cyber-Physical Systems

- CPS Overview and CPS in the real world
- Basic principles of design and validation of CPS
- Industry 4.0
- Building Automation, Medical CPS
- CPS HW platforms -Processors, Sensors, Actuators
- CPS Network –Wireless Hart, CAN, Automotive Ethernet

Internet of Things

- IoT Overview
- IoT Platforms
- Sensors & Interfaces
- Linux Scripting for IoT
- Python Programming
- Wireless PAN (Bluetooth & Zigbee), GSM, Wifi
- Wireless Sensor Networks

Learning Outcomes

After successful completion of this module, students should be able to:

- Apply the concepts of CPS and IoT to develop application
- Implement IoT applications using proper hardware and software platforms
- Develop IoT Applications with open source platforms

Reading List

1. 6LoWPAN: The Wireless Embedded Internet, Zach Shelby, Carsten Bormann, Wiley
2. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, Dr. Ovidiu Vermesan, Dr. Peter Friess, River Publishers
3. Interconnecting Smart Objects with IP: The Next Internet, Jean-Philippe Vasseur, Adam Dunkels, Morgan Kuffmann
4. The Internet of Things: From RFID to the Next-Generation Pervasive Networked Lu Yan, Yan Zhang, Laurence T. Yang, Huansheng Ning
5. Internet of Things (A Hands-on-Approach), Vijay Madiseti, Arshdeep Bahga
6. Designing the Internet of Things, Adrian McEwen (Author), Hakim Cassimally
7. Asoke K Talukder and Roopa R Yavagal, "Mobile Computing," Tata McGraw Hill, 2010.
8. Computer Networks; By: Tanenbaum, Andrew S; Pearson Education Pte. Ltd., Delhi, 4th Edition
9. Data and Computer Communications; By: Stallings, William; Pearson Education Pte. Ltd., Delhi, 6th Edition
10. F. Adelstein and S.K.S. Gupta, "Fundamentals of Mobile and Pervasive Computing," McGraw Hill, 2009.