CSE2042: Device Programming for IoT

Programme: B.Tech (CSE) Year: 4 Semester: 7
Course: Program Elective Credits: 3 Hours: 10(L)+40(P)

Course Context and Overview:

Internet of Things (IoT) is presently a hot technology worldwide. Arduino and Raspberry pi are proven hardware in IoT arena. This course covers various aspects of IoT application design including interfacing with sensor and actuator, networking and data analytics using Ardunio and Raspberry pi. This course emphasizes on hands on experience to convert concept to working model. During this course students will also learn various IoT application areas. This will enable students to develop a prototype to showcase their knowledge of IoT. Therefore, it is very important to learn device programming to strengthen understanding of this emerging technology.

Prerequisites Courses: Computer Programming, Computer Networks

Course Outcomes (COs):

On completion of this course, the students will have the ability to:
CO1: Understand essence of embedded board and associative components (Sensor and Actuator devices).
CO2: Understand and implement Communication and Networking technology using Arduino and Raspberry pi
CO3: Apply concepts of data acquisition, transmission processing and analysis using cloud computing
CO4: Build and test a complete working IoT model

Course Topics:

Contents		**Lecture+Lab Hours**
UNIT 1 **Introduction:**		3+0
1.1 Introduction to Embedded Systems, WSN, IoT, CPS	1	
1.2 Sensing and Actuation	2	
UNIT 2 **Programming with Arduino and Raspberry Pi**		2+12

2.1 Introduction to Arduino and Raspberry Pi	1	
2.2 Introduction to Python Programming	1	
2.3 Lab (Experiments on Arduino and Raspberry pi)	12	
UNIT 3 **Networking with Arduino and Raspberry Pi**		4+12
3.1 Connectivity Technologies (Sensor, M2M)	4	
3.2 Lab (WSN Applications)	12	
UNIT 4 **Cloud Computing and Analytics**		2+6
4.1 Cloud Computing, Data Handling and Analytics	2	
4.2 Lab (ThingSpeak, Node-RED)	6	
UNIT 5 **Applications of IoT**		0+10
5.1 Lab related to Smart Cities and Smart Homes/ Connected Vehicles/ Smart Grid/ Industrial IoT/ Agriculture, Healthcare, Activity Monitoring	10 lab hrs	

References:

1. Karvinen, Kimmo, and Tero Karvinen. "*Getting Started with Sensors": Measure the World with Electronics, Arduino, and Raspberry Pi*. Maker Media, Inc., 2014.
2. Monk, Simon. "*Raspberry Pi cookbook": Software and hardware problems and solutions*. O'Reilly Media, Inc., 2016.
3. Pethuru Raj and Anupama C. Rama, "*The Internet of Things": Enabling Technologies, Platforms and Use Cases*. CRC Press, 1st Edition, 2017.
4. Arshdeep Bahga and Vijay Madisetti, "*Internet of Things": A Hands-on Approach.* Universities Press, 2015.

Evaluation Methods:

Component	Weightage (%)
Quiz /Continuous Evaluation	25
Mid Term	15
End Term (Theory/Lab)	30
Project	30

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