

Branch Name:	Information Technology
Program Code:	ET105
Course Title:	Internet of Things and Applications
Course Code:	2ET1050603T
Pre-requisite Course:	Programming and Digital Concepts

Course Objectives:

1. To study fundamental concepts of IoT
2. To understand roles of sensors in IoT
3. To Learn different protocols used for IoT design
4. To be familiar with data handling and analytics tools in IoT
5. Understand the role of IoT in various domains of Industry.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)									Total (Marks)
					Theory (Marks)				Practical (Marks)					
	L	T	P	Total	SEE		CCA		SEE		CCA			
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.		
3	3	-	-	3	24	60	16	40	-	-	-	-	100	

Course Contents:

Unit No	Topics	Total Hours	Weightage (%)
1	IoT Introduction and Fundamentals: Deciphering the term IoT Applications where IoT can be deployed Benefits/Challenges of deploying an IoT, IoT components: Digital Signal Processing, Data transmission, Choice of channel (wired/wireless), back-end data analysis. Understanding packaging and power constraints for IoT implementation.	4	10%
2	Signals, Sensors, Actuators, Interfaces: Introduction to sensors & transducers, Introduction to electrodes & biosensors, Static and dynamic characteristics of sensors, Different types of sensors, Selection criteria's for sensors / transducers, Signal conditioning modules of IoT system, Energy and power considerations, Introduction to actuators, Different types of actuators, Interfacing challenges, Modules of data acquisition system, Wireless sensor node structure, positioning topologies for IoT infrastructure.	8	25%
3	Communication and Networking in IoT: Review of Communication Networks, Challenges in Networking of IoT Nodes, range, bandwidth Machine-to-Machine (M2M) and IoT Technology Fundamentals, Medium Access Control (MAC) Protocols for M2M Communications Standards for the IoT Basics of 5G Cellular Networks and 5G IoT Communications, Low-Power Wide Area networks (LPWAN)Wireless communication for IoT: channel models, power budgets, data rates. Networking and communication aspects: IPv6, 6LoWPAN, COAP, MQTT, Operating Systems need and requirements for IoT.	8	15%
4	Modern networking: Cloud computing: Introduction to the Cloud Computing, History of cloud computing, Cloud service options, Cloud Deployment models, Business concerns in the cloud, Hypervisors, Comparison of Cloud providers, Cloud and Fog Ecosystem for IoT Review of architecture	5	10%

5	IoT Data analytics and Security: OLAP and OLTP, NoSQL databases, Row and column Oriented databases, Introduction to Columnar DBMS CStore, Run: Length and Bit vector Encoding, IoT Data Analytics. Cryptographic algorithms, Analysis of Light weight Cryptographic solutions IoT security, Key exchange using Elliptical Curve Cryptography, Comparative analysis of Cryptographic Library for IoT.	6	20%
6	IoT Applications: IoT applications like Home Automation, Precision Agriculture, Smart vehicles, Smart Grid, Industry 5.0.	5	20%

Reference Books:

1. Arshdeep Bahga and Vijay Madisetti, “Internet of Things, a hands on approach” , Universities Press (India) Pvt. Ltd. 2017.
2. Rajkumar Buyya, Amir Vahid Dastjerdi, “Internet of Things Principles and Paradigms” Copyright © 2016 Elsevier Inc.
3. William Stallings, “ Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud” Publisher: Addison-Wesley 2015
4. Hakima Chaouchi, — “The Internet of Things Connecting Objects to the Web” ISBN : 978-1- 84821-140-7, Wiley Publications
5. Olivier Hersent, David Boswarthick, and Omar Elloumi, — “The Internet of Things: Key Applications and Protocols”, Wiley Publications
6. J. Biron and J. Follett, "Foundational Elements of an IoT Solution", O'Reilly Media, 2016.
7. Keysight Technologies, “The Internet of Things: Enabling Technologies and Solutions for Design and Test”, Application Note, 2016.

List of Open-Source Software/learning website:

- [Introduction to Internet of Things - Course \(nptel.ac.in\)](https://nptel.ac.in/courses/106/01/201901)
- [An Introduction to Programming the Internet of Things \(IOT\) | Coursera](https://www.coursera.org/learn/internet-of-things)
- [Introduction to the Internet of Things and Embedded Systems | Coursera](https://www.coursera.org/learn/internet-of-things-and-embedded-systems)
- [AWS Skill Builder - Internet of Things Foundation Series](https://aws.amazon.com/skillbuilder/paths/internet-of-things-foundation-series/)
- [Calculator, breakout & Icon editor - Wokwi ESP32, STM32, Arduino Simulator](https://www.wokwi.com/)
- [Tinkercad - Create 3D digital designs with online CAD](https://www.tinkercad.com/)

Course Learning Outcomes (CLO):

Course Outcomes	Description	Bloom's Taxonomy Level
COL1	Illustrate the fundamentals of IoT	1.Remembering, 2.Understanding
COL2	Identify suitable hardware and interfaces for IoT deployments	4. Analyze, 5. Creating
COL3	Develop cloud computing model and service options	2. Understanding, 3. Apply
COL4	Illustrate data analytics and security for IoT	4. Analyze, 5. Evaluate

Mapping of CLO with PO and PSO:

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CLO1	H	L	M	H	M	M	L	L	M		L	L	M	M
CLO2	M	H	H	H	H	L	M	L	M		M	L	H	H
CLO3	M	M	H	M	H	M	L	L	L		M	L	M	M
CLO4	L	M	M	M	H	H	L	H	M		M	L	M	H

H: High, M: Medium, L: Low