



FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: MINOR DEGREE IN INTERNET OF THINGS (IoT)

Semester: VI

Course Code: 202170501

Course Title: IoT System Design

Course Group: Minor Course

Course Objectives: To give students hands-on experience using different IoT architectures and provide skills for interfacing sensors and actuators with different IoT architectures. To apply Cloud computing, Machine learning and Data analytics for industrial applications based on IoT.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
3	0	2	4	50/18	50/17	25/9	25/9	150/53

* J: Jury; V: Viva; P: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	Introduction to Raspberry Pi & Gateways: Introduction, Edge Devices- Raspberry Pi, A short tour of Linux operating system, Programming edge node, Introduction to Gateways, Gateways types and configurations, Gateway as an extension of the cloud, HTTP access method using API, Introduction and installing the Raspbian Stretch OS, Headless.	06
2	Interfacing of Raspberry Pi: A short tour of Linux operating system - Computer and Rpi configuration to connect Rpi remotely without Ethernet cable via SSH, IP address, Rpi - Testing the GPIO pins through Scripts, Raspberry pi3 interfacing with Sensor DHT11, Raspberry pi pythonlibrary install and reading sensor feed, Storing sensor data in cloud and in database, MySQL server on Raspi.	08
3	IoT and data analytics: IoT and Data Management, Data cleaning and processing, Data storage models. Search techniques, Deep Web, Semantic sensor web, Semantic Web Data Management, Searching in IoT, Real-time and Big Data Analytics for The Internet of Things	05
4	Data Processing: Heterogeneous Data Processing, High-dimensional Data Processing, Parallel and Distributed Data Processing.	04



5	Cloud of Things: IoT Physical Servers, Cloud Offerings, and IoT Case Studies, Introduction to Cloud Storage Models, Communication API, Eclipse IoT, AWS IoT, Google Cloud IoT, ThingWorx.	03
6	Python Libraries for Machine Learning: Python basics and its libraries for machine learning, NumPy, Pandas, SciPy, Matplotlib and SciKit Learn.	04
		30

List of Practicals / Tutorials:

1	Rpi3 introduction and installing the Raspbian Stretch OS.
2	Overview of the graphic user interface for Raspbian Linux distribution and operate the Raspberry Pi in "headless mode".
3	Testing the GPIO pins of Rpi by python programs and scripts.
4	Raspberry pi3 python library installation and reading sensor feed.
5	'Plug and play' type cloud platform overview for integration to IoT devices.
6	To create a standalone web server with a Raspberry Pi that displays temperature and humidity readings with a DHT11 sensor (Connected to 8266).
7	Real time license plate recognition using raspberry pi
8	Design a face recognition robot using Raspberry pi.
9	Environment setup for Android Things with Raspberry pi.
10	Implement an artificial neural network that can recognize keywords in speech.
11	Design a line follower robot using Raspberry pi.

Reference Books:

1	Sudip Misra, Chandana Roy and Anandarup Mukherjee, "Introduction to Industrial Internet of Things and Industry 4.0", CRC Press
2	Rahul Dubey, "An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications", Cengage India Publication
3	Richardson, M, Wallace, S., "Getting started with raspberry PI ", O'Reilly Publisher Media, Inc.
4	Shrirang Ambaji Kulkarni, "Introduction to IOT with Machine learning and Image Processing using Raspberry Pi", CRC Press
5	Rao, M, "Internet of Things with Raspberry Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects", Packt Publishing Ltd
6	Andrew Minter, "Analytics for the Internet of Things (IoT)", Packt Publishing Ltd

Supplementary learning Material:

1	https://onlinecourses.nptel.ac.in/noc21_cs63/preview
2	Linux Operating System - Course (swayam2.ac.in)
3	NPTEL: Computer Science and Engineering - NOC: Python for Data Science
4	NPTEL: Computer Science and Engineering - NOC: Introduction to internet of things



Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	25	20	15	15	10

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	% weightage
CO-1	To learn Python for Machine learning applications	25
CO-2	To understand Raspberry PI along with critical protocols and its communication to cloud.	25
CO-3	To be able to design web/cloud based IoT applications.	25
CO-4	Install, configure and use of AWS CLI and SDK on a Linux system with applications of various AWS services.	25

Curriculum Revision:

Version:	2.0
Drafted on (Month-Year):	June -2022
Last Reviewed on (Month-Year):	-
Next Review on (Month-Year):	June-2025