INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

EMBEDDED IOT SYSTEM DESIGN								
I Semester: ES								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
BESE29	**Elective**	3	-	-	3	40	60	100
Contact Classes: 45	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite: **Embedded Communication Protocols for IoT.**								

I. COURSE OVERVIEW:

This course introduces the foundational principles and system-level design of the Internet of Things (IoT). It covers the basic concepts, definitions, and significance of IoT in modern connected systems. Students will learn about the interaction between IoT and Machine-to-Machine (M2M) communication, and how they integrate to form intelligent networks. The course provides a detailed understanding of IoT architecture, including device-level design, network protocols, and data management. By the end of the course, students will have a comprehensive view of how to design and develop scalable, interoperable, and secure IoT systems.

II. COURSES OBJECTIVES:

The students will try to learn

I. Integrate the sensors and actuator depending on the applications
II. Interface the IoT and M2M with value chains
III. Write Python programming for Arduino, Raspberry Pi devices
IV. Design IoT based systems such as Agricultural IoT, Vehicular IoT etc.

III. COURSE OUTCOMES:

At the end of the course students should be able to:

CO 1 Describe the fundamental concepts, characteristics, and application areas of the Internet of Things (IoT) and Its evolution.
CO **2** Differentiate between M2M (Machine-to-Machine) and IoT, and understand the role of SDN and NFV in IoT systems.
CO 3 Implement hands-on projects by integrating sensors and actuators using platforms like Arduino and Raspberry Pi.
CO 4 Analyze and compare different IoT architectures and understand the components of the core IoT functional stack.
CO 5 Identify and apply the principles of embedded networking and communication for IoT system design.
CO 6 Evaluate and address the challenges associated with designing and implementing IoT systems for specific applications, such as agriculture, healthcare, and smart cities.

IV. COURSE CONTENT:

MODULE - I: IOT INTRODUCTION (09)

Introduction and definition of IoT, Evolution of IoT, IoT growth, Application areas of IoT, Characteristics of IoT, IoT stack, Enabling technologies, IoT levels, IoT sensing and actuation, Sensing types, Actuator types.

MODULE –II: I OT AND M2M (09)

M2M to IoT – A Basic Perspective– Introduction, Differences and similarities between M2M and IoT, SDN and NFV for IoT.M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies.

MODULE –III: IOT HANDS-ON (10)

Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino. Introduction to Python Programming.

Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi.

MODULE –IV: IOT ARCHITECTURE: (10)

IoT Architecture components, Comparing IoT architectures, A simplified IoT architecture, The core IoT functional stack, IoT data management and compute stack.

MODULE –V: EMBEDDED NETWORKING AND COMMUNICATION (10)

IoT System design: Challenges associated with IoT, Emerging pillors of IoT, Agricultural IoT, Vehicular IoT, Healthcare IoT, Smart cities, Transportation and logistics.

V. TEXT BOOKS:

1.Frank Vahid, Tony Givargis, “Embedded System Design”, John Wiley Publications, 3rd Edition, 2006.

VI. REFERENCE BOOKS:

1. Raj Kamal, “Embedded Systems”, TMH, 2nd Edition, 2008.
2. Shibu K.V, “Introduction to Embedded Systems, McGraw Hill, 3rd Edition, 2012.
3. Lyla, “Embedded Systems”, Pearson Education, 2nd Edition, 2013.

VII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Assignments
4. Model question paper - I
5. Model question paper - II
6. Lecture notes
7. Power point presentations
8. Early Lecture Readiness Videos