Program: B.Sc.- Computer Science					Semester : IV	
Course: Physical Computing and IoT Programming					Course Code: USMACS403	
Teaching Scheme					Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit		Continuous Assessment and Evaluation (CAE) (Marks - 25)	Term End Examinations (TEE) (Marks-75 in Question Paper)
02	02	-	2+1=3		25	75

Learning Objectives:

To learn about SoC architectures; Learn how Raspberry Pi. Learn to program Raspberry Pi. Implementation of internet of Things and Protocols

Course Outcomes:

CO1 : Enable learners to understand System On Chip Architectures.

CO2 : Introduction and preparing Raspberry Pi with hardware and installation.

CO3: Learn physical interfaces and electronics of Raspberry Pi and program them using practical's

CO4 : Learn how to make consumer grade IoT safe and secure with proper use of protocols.

Outline of Syllabus: (per session plan)

Module	Description	No of hours
1	Introduction to Microcontroller, Raspberry Pi	10
2	M2M to IoT _ A Market, M2M and IoT Technology Fundamentals	10
3	IoT and Protocols, IoT Security and Interoperability	10
	Total	30
PRACTICALS		30

Module	Physical Computing and IoT Programming	No. of Hours/Credits 30/2
1	Introduction to Microcontroller, Embedded system and micro processors	10
	Characteristics microcontroller. **SoC and Raspberry Pi** **System on Chip** : What is System on chip? Structure of System on Chip. **SoC products** : FPGA, GPU, APU, Compute Units. **ARM 8 Architecture** : SoC on ARM 8. ARM 8 Architecture Introduction **Introduction to Raspberry Pi** : Introduction to Raspberry Pi, Raspberry Pi Hardware, Preparing your raspberry Pi. **Programming Raspberry Pi** **Raspberry Pi and Linux:** About Raspbian, Configuring Raspberry Pi with Linux Commands **Programing interfaces:** Introduction to Node.js, **Raspberry Pi Interfaces:** UART, GPIO, I2C, SPI **Useful Implementations:** Cross Compilation, Pulse Width Modulation, SPI for Camera.	
2	M2M to IoT _ A Market, M2M and IoT Technology Fundamentals	10
	Introduction of M to M : A brief background M2M communication A typical M2M solution overview Key application areas Trends in information and communications technologies **M2M to IoT _ A Market** Perspective Information marketplaces ,Global value chains, M2M value chains, IoT value chains M2M to IoT _ An Architectural Overview Building an architecture **M2M and IoT Technology Fundamentals** Devices and gateways , Local and wide area networking, Data management, M2M and IoT analytics, Knowledge management, **Architecture Reference Model** IoT reference model, Information model, Functional model, Communication model, Safety, privacy, trust, security model	
3	IoT and Protocols, IoT Security and Interoperability	10
	Introduction to IoT: What is IoT? IoT examples, Simple IoT LED Program. **IoT and Protocols** **IoT Security:** UPnp, CoAP, MQTT, XMPP . **IoT Service as a Platform:** Clayster, Thinger.io, SenseIoT, carriots and Node RED. **IoT Security and Interoperability:** Risks, Modes of Attacks, Tools for Security and Interoperability.	

PRACTICALS	
Sr. No.	Topic.
1	Study of Linux Commands
2	Study of different IC's (8255 , 8259, 8237 and UART)
3	Study and Understanding of Raspberry Pi
4	GPIO: Light the LED with Python
5	Stepper Motor Control: PWM to manage stepper motor speed
6	Study of software used in raspberry pi
7	Case study on IoT in different fields
8	Study / learn any application using raspberry pi
9	GPIO : to control the brightness of LED using Raspberry Pi
10	Stack of Raspberry Pi for better Computing and analysis

RECOMMENDED READING:

Text Books:

1) Learning Internet of Things, Peter Waher, Packt Publishing(2015)
2) Mastering the Raspberry Pi, Warren Gay, Apress(2014)

Reference Books

1. Abusing the Internet of Things, Nitesh Dhanjani, O'Reilly