

21IOT05	PROGRAMMING FOR IOT BOARDS	L	T	P	C
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<p><u>Course Objectives</u></p> <ul style="list-style-type: none"> To introduce Internet of Things (IoT) environment and its technologies for designing smart systems To explore open-source computer hardware/software platform, development and debugging environment, programming constructs and necessary libraries To learn embedded programming constructs and real time systems 					
UNIT I	INTRODUCTION TO IOT BOARDS	9 Hours			
IoT- Introduction and Characteristics, Things, Architecture, Enabling Technologies, Challenges, Levels - Environment -board, IDE, shields; Programming - syntax, variables, types, operators, constructs and functions; sketch - skeleton, compile and upload, accessing pins; debugging - UART communication protocol and serial library					
UNIT II	INTERFACING WITH IOT BOARDS	9 Hours			
Circuits - design, wiring, passive components; sensors and actuators, interfacing, read and write; software libraries to handle complicated hardware; shields, interfacing and libraries					
UNIT III	SINGLE BOARD COMPUTERS AND PYTHON	9 Hours			
Board schematic, setup, configure and use, OS implications; linux - basics, file system and processes, shell CLI, GUI; python - basics, API's RPi.GPIO, PWM library to access pins, Tkinter					
UNIT IV	INTERFACING WITH SINGLE BOARD COMPUTERS	9 Hours			
Networking - Internet Connectivity, Standard Internet Protocols, MQTT, CoAP, Networking Socket Interface; Cloud - Public APIs and SDK's for accessing cloud services, Twitter API using Twython package; Interfacing - sensors and actuators, Pi Camera, Servo, A/D, D/A					
UNIT V	EMBEDDED PROGRAMMING AND RTOS	9 Hours			
MCU - GPIO, WDT, timers/counters, IO, A/D, D/A, PWM, Interrupts, Memory, serial communication- UART, I2C, SPI, Peripheral Interfacing OS - basics, types, tasks, process, threads (POSIX Threads), thread preemption, Preemptive Task Scheduling Policies, Priority Inversion, Task communication, Task Synchronization issues - racing and deadlock, binary and counting semaphores (Mutex example), choosing RTOS					
UNIT VI	CASE STUDY				
<p><u>Course Outcome:</u></p> <ol style="list-style-type: none"> Investigate various challenges in designing IoT devices Use open-source hardware prototyping platform for building digital devices and interactive objects that sense and control the physical world around them Understand basic circuits, sensors and interfacing, data conversion process and shield libraries to interface with the real world Program SBC for practical IoT devices using Python Explore protocols, data conversion process, Api and expansion boards for real world interaction Learn embedded programming constructs and constraints real time systems Illustrate IoT prototyping for real world socio-economic problems 					

Text Books:

- Yamanoor, Sai, and Srihari Yamanoor. Python Programming with Raspberry Pi, 1st edition, PacktPublishing Ltd, 2017.
- Donald Norris, The Internet of Things: Do-It-Yourself Projects with Arduino, Raspberry Pi, andBeagleBone Black, 1st edition,McGraw Hill Education, 2015

Reference Books:

- Marco Schwartz, Home Automation with Arduino, 3rd edition, Open Home Automation 2014. Schwartz, Marco. Internet of things with arduino cookbook, 1st edition, Packt Publishing Ltd, 2016.
- Kooijman, Matthijs. Building Wireless Sensor Networks Using Arduino, 1st edition, Packt PublishingLtd, 2015.