



Department of INFORMATION TECHNOLOGY	LP: Sub Code OE22802
B.E/B.Tech/M.E/M.Tech : <u>Student Branch</u> :EE,CH,MN,ME Regulation: 2022 PG:NA Specialisation : NA	Rev. No: 00 Date: 08/07/24
Sub. Code / Sub. Name : <b>OE22802/Programming for IOT</b>	
Unit : I-V	

### Unit Syllabus: UNIT I IoT Ecosystem and Programming for Prototyping Boards

Introduction to IoT Defining IoT, Challenges and Levels of implementation, Enabling Technologies, Programming Environment Board, IDE, shields, Programming: syntax, variables, types, operators, constructs, and functions Sketch: skeleton, compile and upload, UART communication protocol.

#### Objective:

1. Understand the definition and significance of the Internet of Things
2. Discuss the architecture, operation, challenges and Levels of Implementation
3. Explore programming Environment, Board, IDE, skeleton, compile and upload
4. Debugging Communication protocol, Understand the serial Library

Session No *	Topics to be covered	Ref	Teaching Aids
1	Challenges and Levels of implementation	Internet of things (Arshdeep, Vijay)	PPT/Mind Mapping
2	Enabling Technologies	Internet of things (Arshdeep, Vijay) 2-	PPT/Chalk and Talk
3	Overview of Processing Elements, Peripherals	<a href="https://www.geeksforgeeks.org/components-">https://www.geeksforgeeks.org/components-</a>	PPT/Chalk and Talk
4	Programming-Environment: Board, IDE, shields	<a href="https://www.geeksforgeeks.org/world-of-iot-">https://www.geeksforgeeks.org/world-of-iot-</a>	PPT/Simulation Tools IDE
5	Programming: syntax, variables, types,	<a href="https://www.geeksforgeeks.org/python-">https://www.geeksforgeeks.org/python-</a>	PPT/Chalk and Talk
6	operators, constructs, and functions	<a href="https://www.geeksforgeeks.org/python-">https://www.geeksforgeeks.org/python-</a>	PPT/Chalk and Talk
7	Sketch: skeleton, compile and upload, accessing pins	internet	PPT/Mind Mapping
8	debugging: UART communication protocol	Internet	PPT/Mind Mapping
9	serial library	Internet	PPT/Q&A
<b>Content beyond syllabus covered (if any):</b>			

\* Session duration: 50 minutes



Sub. Code / Sub. Name: **OE22802/Programming For IOT**

Unit: **II**

**Unit Syllabus: Interfacing and Programming for Single Board Computers**

Introduction Circuits: design, wiring, passive components sensors and actuators interfacing, read and write. Board schematic, setup, configure and use OS implications Linux basics file system and processes Shell CLI, GUI Programming APIs GUI, Programming APIs, RPi.GPIO, PWM library to access pins -Tkinter

**Objective:**

1. Understanding the SBC circuits, design and wiring
2. Learn Passive components detail Sensors and actuators interfacing and Board Schematic setup and Configuration Understanding OS Linux basics, Shell, GUI and APIs
3. RPi.GPIO and PMW library to access pins TKinter.

Session	Topics to be covered	Ref	Teaching Aids
10	Introduction Circuits: design, wiring	<a href="https://en.wikipedia.org/wiki/Single-board_computer">https://en.wikipedia.org/wiki/Single-board_computer</a>	PPT/Think pair & Share
11	passive components - sensors and actuators interfacing, read and write.	<a href="https://www.student-circuit.com/blog/a-beginners">https://www.student-circuit.com/blog/a-beginners</a>	PPT/Chalk and Talk
12	Board schematic – setup - configure and use	<a href="https://medium.com/@mugorevelyne/sen">https://medium.com/@mugorevelyne/sen</a>	PPT/Simulation
13	OS implications: Linux - basics	<a href="https://linux-training.be/linuxfun.pdf">https://linux-training.be/linuxfun.pdf</a>	Activity based learning
14	file system and processes	<a href="https://linux-training.be/linuxfun">https://linux-training.be/linuxfun</a>	Activity based
15	Shell CLI	<a href="https://linux-training.be/linuxfun">https://linux-training.be/linuxfun</a>	Activity based
16	GUI - Programming APIs	<a href="https://www.hologram.io/blog/iot-apis-guide/interface/">https://www.hologram.io/blog/iot-apis-guide/interface/</a>	PPT/Think Pair & Share
17	RPi.GPIO	<a href="https://projects.raspberrypi.org/en/project">https://projects.raspberrypi.org/en/project</a>	Chalk and Talk
18	PWM library to access pins -Tkinter	<a href="https://www.geeksforgeeks.org/python-">https://www.geeksforgeeks.org/python-</a>	PPT/Tkinter.ca
<b>Content beyond syllabus covered (if any):</b>			

\* Session duration: 50 mins





Sub. Code / Sub. Name: **OE22802/Programming For IOT**  
**Unit - III**

**Unit Syllabus: Interfacing with Single Board Computers**

Networking, Internet Connectivity, Standard Internet Protocols, MQTT CoAP, Networking Socket Interface, Cloud, Public APIs, SDKs for accessing cloud services, Social Network APIs, Interfacing sensors and actuators, Pi Camera, Servo, APIs for data conversion

**Objective:**

1. Understand the Standard Internet Protocols, SDKs for accessing cloud services
2. To know the Networking Socket Interface.
3. Understand the Social Network APIs, Pi Camera, Servo and APIs for data conversion.

Session	Topics to be covered	Ref	Teaching Aids
19	Networking, Internet Connectivity	Internet <a href="https://www.fogwing.io/types-of-iot-networks/#:~:text=What%20is%20IoT%20Network%3F,interfaces%20available%20within%20reachable%20distance.">https://www.fogwing.io/types-of-iot-networks/#:~:text=What%20is%20IoT%20Network%3F,interfaces%20available%20within%20reachable%20distance.</a>	Chalk and Talk
20	Standard Internet Protocols, MQTT CoAP	<a href="https://en.wikipedia.org/wiki/MQTT">https://en.wikipedia.org/wiki/MQTT</a>	PPT/Mind mapping
21	Networking Socket Interface	<a href="https://www.geeksforgeeks.org/socket-in-computer-network/">https://www.geeksforgeeks.org/socket-in-computer-network/</a>	PPT/Mind mapping
22	Cloud, Public APIs	Internet <a href="https://www.ece.iastate.edu/~kamal/Docs/kk04.pdf">https://www.ece.iastate.edu/~kamal/Docs/kk04.pdf</a>	PPT/Think pair & Share
23	SDKs for accessing cloud services	Internet Wireless Sensor Networks A Networking Perspective	PPT
24	Social Network APIs, Interfacing	<a href="https://en.wikipedia.org/wiki/Wireless_sensor_network">https://en.wikipedia.org/wiki/Wireless_sensor_network</a>	PPT
25	sensors and actuators	Internet	Chalk and Talk
26	Pi Camera – Servo	<a href="https://makersportal.com/blog/2020/3/21/raspberry-pi-servo-panning-camera">https://makersportal.com/blog/2020/3/21/raspberry-pi-servo-panning-camera</a>	PPT/Simulation Tools
27	APIs for data conversion	<a href="https://www.lifesight.io/blog/guide-to-conversions-api">https://www.lifesight.io/blog/guide-to-conversions-api</a>	PPT/Activity based

**Content beyond syllabus covered (if any):**

Session duration: 50 mins



Sub. Code / Sub. Name: **OE22802/Programming For IOT**  
**Unit – IV**

**Unit Syllabus: IV Embedded Programming and RTOS**

MCU GPIO WDT timers/counters I/O 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-choosing RTOS.

**Objective:**

1. Embedded programming constructs and constraints in real-time systems for real-world socio-economic problems.
2. Understand the timers/counters, I2C, SPI, Peripheral Interfacing OS, basics, types and POSIX Threads
3. Understand Preemptive Task Scheduling Policies and Priority Inversion
4. To know racing and deadlock-choosing RTOS

Session	Topics to be covered	Ref	Teaching Aids
28	MCU, GPIO, WDT	<a href="https://www.tutorialspoint.com/which-microcontroller-is-suitable-for-the-">https://www.tutorialspoint.com/which-microcontroller-is-suitable-for-the-</a>	PPT
29	timers/counters I/O	<a href="https://www.tutorialspoint.com/embedded-systems/es-timer-counter.htm">https://www.tutorialspoint.com/embedded-systems/es-timer-counter.htm</a>	PPT/Demos
30	A/D, D/A, PWM, Interrupts, Memory	<a href="https://www.microcontrollerboard.com/analog-to-digital-converter.html">https://www.microcontrollerboard.com/analog-to-digital-converter.html</a>	PPT/Demos
31	serial communication, UART I2C	<a href="https://www.totalphase.com/blog/2020/12/differences-between-uart-i2c/">https://www.totalphase.com/blog/2020/12/differences-between-uart-i2c/</a>	PPT/Simulation Tools
32	SPI, Peripheral Interfacing OS, basics, types	Internet	Chalk and Talk
33	tasks – process - threads (POSIX Threads) - thread preemption	Internet	Chalk and Talk
34	Preemptive Task Scheduling Policies, Priority Inversion	Internet	PPT/Think Pair & Share
35	Task communication, Task Synchronization issues	<a href="https://www.scribd.com/presentation/414767653/Chapter-10-RTOS-Task-Synchronization-Techniques-ppt">https://www.scribd.com/presentation/414767653/Chapter-10-RTOS-Task-Synchronization-Techniques-ppt</a>	Mind Mapping
36	racing and deadlock-choosing RTOS	<a href="https://www.freertos.org/FreeRTOS_Support_Forum_Archive/April_2006/freertos_Deadlock_starvation_priorit">https://www.freertos.org/FreeRTOS_Support_Forum_Archive/April_2006/freertos_Deadlock_starvation_priorit</a>	PPT/Q & A

**Content beyond syllabus covered (if any):**

\* Session duration: 50 mins





Sub. Code / Sub. Name: **OE22802/Programming For IOT**  
**Unit -V**

### Unit Syllabus: RTOS and Real World Projects

IoT Integrated Primary Health Care, Face Detection by AI Cloud IoT Systems for Smart Agriculture, Smart Home Gadgets, Autonomous Car Features, speed and horn intensity Control, estimating program run times, Task Assignment and Scheduling, Fault Tolerance Techniques Reliability, Evaluation

#### Objective:

1. To develop various IoT applications like IoT Integrated Primary Health Care, Face Detection by AI, Smart Home Gadgets, Autonomous Car Features
2. To know the Fault Tolerance Techniques, reliability and Evaluation

Session No *	Topics to be covered	Ref	Teaching Aids
37	IoT Integrated Primary Health Care	<a href="https://ordr.net/article/iot-healthcare-examples">https://ordr.net/article/iot-healthcare-examples</a>	PPT/Simulation Tools based
38	Face Detection by AI	<a href="https://www.techtarget.com/searchenterpriseai/definition">https://www.techtarget.com/searchenterpriseai/definition</a>	Animated Videos
39	Cloud IoT Systems for Smart Agriculture	<a href="https://www.sciencedirect.com/science/article/pii/S0926580518300666">https://www.sciencedirect.com/science/article/pii/S0926580518300666</a>	Demos
40	Smart Home Gadgets, Autonomous Car Features	Internet	Simulation Tools
41	speed and horn intensity Control	Internet	Demos
42	Estimating program run times	<a href="https://www.geeksforgeeks.org/how-to-calculate-program-run-time/">https://www.geeksforgeeks.org/how-to-calculate-program-run-time/</a>	Activity Based
43	Task Assignment and Scheduling	Internet	PPT/Activity Based
44	Fault Tolerance Techniques	Internet	PPT/Chalk and Talk
45	Reliability, Evaluation	Internet	PPT/Chalk and Talk

#### Content beyond syllabus covered (if any):

Data Analytics for IoT

\* Session duration: 50 mins



## SRI VENKATESWARA COLLEGE OF ENGINEERING

## COURSE DELIVERY PLAN - THEORY

CO	Statements	RBT Level
CO1	Students will able to understand the IoT basic concepts, its design, levels in IOT and its uses.	AP
CO2	Students will able to Understand State of the Art – IoE Architecture and to classify Real World IoE Design Constraints, Industrial Automation in IoE	AN
CO3	Students will get clear idea about the medium, protocols, and various issues in implementing the IoT	AN
CO4	Students will understand the tools for the development of IoT and IoE	E
CO5	Students will able to develop the various applications using the tools	AN

**TEXT BOOKS:**

1. Yamanoor, Sai, and Srihari Yamanoor. Python Programming with Raspberry Pi, 2017, 1st edition, Packt Publishing Ltd., UK

**REFERENCES:**

1. Donald Norris, The Internet of Things: Do-It-Yourself Projects with Arduino, Raspberry Pi, and BeagleBone Black, 2015, 1st edition, McGraw Hill Education, India.
2. Marco Schwartz, Home Automation with Arduino, 3rd edition, Open Home Automation 2014. Schwartz, Marco. Internet of things with arduino cookbook, 2016, 1st edition, Packt Publishing Ltd., UK.

	Prepared by	Approved by
Signature		
Name	MS. Dheepa. B	Dr. V. Vidhya
Designation	Assistant Professor	HOD/INT
Date	08-07-24	8/7/24
Remarks *:		
Remarks *:		

\* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD