

3EL82: BASICS OF EMBEDDED AND IOT SYSTEMS
CREDITS –4 (LTP: 3,0,1)

Course Objective:

1. To provide students with good depth of knowledge of Designing Embedded and IOT Systems for various application.
2. Knowledge for the design and analysis of Embedded and IOT Systems for Electronics Engineering students.

Teaching and Assessment Scheme:

Teaching Scheme (Hours per Week)			Credits	Assessment Scheme				Total Marks
L	T	P		C	Theory Marks		Practical Marks	
			ESE		CE	ESE	CE	
3	0	2	4	60	40	30	20	150

Course Contents:

Unit No.	Topics	Teaching Hours
1	Introduction to Embedded and IoT Systems: Introduction Embedded and IoT systems, Definition, Examples and components of embedded and IoT Systems, Embedded and IoT Systems Design Process, Various Embedded and IoT cores controllers.	5
2	Hardware/Software Co-design for Embedded and IoT Systems: Microcontrollers for embedded systems, Arduino embedded platform, Peripheral interfacing and programming with Arduino platform, Sensors and Actuator interfacing, Cloud support with Arduino platform.	10
3	Protocols for Embedded and IoT systems: Serial protocols, UART, I2C, and SPI. NFC, Wireless protocols like, RFID, Zig-bee, IEEE 802.15.4e, Thread, 6LoWPAN, Constrained Application Protocol (CoAP), Extensible Messaging Protocol (XMPP) , WebSocket , Advanced Message Queueing Protocol (AMQP) , Message Queue Telemetry Transport (MQTT), Web Real Time Communications (WebRTC), LoRa, SIGFOX, Z Wave.	10
4	OS based Software development: Programming in higher level languages on embedded OS platform, Python and C programming, Various aspects of the OS designed for the IoT environment, open source OS for IoT such as Contiki OS, TinyOS etc.	05
5	IoT based Embedded Systems: Basic architecture of an IoT based Embedded Systems., Embedded Hardware for IoT applications, like Raspberry Pi, Arduino, and Raspberry Pi based development board, IoT Cloud Platform and IoT client applications on mobile phones.	05

Unit No.	Topics	Teaching Hours
6	Case Studies of Embedded and IoT Systems: Embedded application development through Arduino and Raspberry Pi based development boards, Development of mini Project on new version of Operating systems and development board. That project should also address to the current societal needs.	05
Total		45

List of References:

1. Muhammad Ali Mazidi Shujen Chen, Sepehr Naimi Sarmad Naimi “*Embedded Programming Using C Language*”, 1st Edition, Freescale ARM Cortex-M.
2. Steve Ferbur, “*ARM System on Chip*”.
3. Rajkamal, “*Embedded System: Architecture, Programming and Design*”, TMH3.
4. Dr. Ovidiu Vermesan, Dr. Peter Friess, “*Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems*”, River Publisher

Course Outcome:

At the end of this course, students will be able to:

1. Knowledge of theory and practice related to Embedded and IOT System.
2. Ability to identify, formulate and solve engineering problems by using Embedded Systems with IoT.
3. Ability to implement real field problem by gained knowledge of Embedded Systems with IoT capability.

Sr. No.	Suggested List of Experiments
1.	Study of Open source operating system used in Embedded Design.
2.	Introduction to Arduino based Embedded System Programming.
3.	LED Interfacing program for Arduino based Embedded System
4.	Interfacing Push button Switch interfacing with Arduino based Embedded System
5.	External Peripheral Interfacing with Arduino based Embedded System.
6.	On Chip peripheral programming with Arduino/Raspberry Pi based Embedded System
7.	Serial Communication Protocol programming with Arduino/Raspberry Pi based Embedded Systems.
8.	Wireless communications with Arduino/Raspberry Pi Embedded IOT Platform.
9.	Bluetooth communication interfacing with Arduino/Raspberry Pi Embedded IOT Board.
10.	WiFi module interfacing with Arduino/Raspberry Pi Embedded IOT Board.
11.	Embedded Systems design with IOT capability.
12.	IOT based Temperature monitoring embedded system with open source cloud tools.
13.	Introduction to RTOS
14.	RTOS based task performances