

**3EC83: EMBEDDED SYSTEMS AND IOT**  
**CREDITS – 4 (LTP: 3,0,2)**

**Course Objective:**

Understand and Design Arduino based embedded systems for branch specific applications.  
Understand and Integrate IoT Platforms to enhance application metrics and accessibility.

**Teaching and Assessment Scheme:**

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

**Course Content:**

Unit No.	Topics	Teaching Hours
1.	<b>Introduction :</b> Numbering and coding systems, semiconductor memory, CPU architecture, Microcontrollers and Microprocessors, embedded system, Introduction to Arduino Uno and Arduino IDE, Structuring an Arduino Program, Using data types and operations.	04
2.	<b>IO Port Programming :</b> Atmega328p pins and functions, IO port programming, Using a Switch, Reading a Keypad, Visual Output, Connecting and Using LEDs, Driving a 7-Segment LED Display, LCD Display.	07
3.	<b>Serial Communication :</b> Introduction to serial communication, Sending Formatted Text and Numeric Data from Arduino, Sending and Receiving Serial Data in Arduino, GSM modem, Bluetooth.	07
4.	<b>Getting Input from Sensors :</b> Reading Analog Values, Detecting Light, Detecting Motion (Integrating Passive Infrared Detectors), Measuring Distance, Detecting Vibration, Detecting Sound, Measuring Temperature, Reading RFID Tags, Tracking Rotary Movement, Detecting Acceleration.	09
5.	<b>Physical Output :</b> Controlling a Servo, driving a Brushless Motor, Controlling Solenoids and Relays, making an Object Vibrate, Controlling the Direction and Speed of a Motor with an H-Bridge, Driving a Stepper Motor.	08
6.	<b>Introduction to IoT :</b> Defining IoT, Characteristics of IoT, design of IoT, Functional blocks of IoT, Communication models & APIs, IOT platforms. ESP8266- Introduction. Domain specific applications of IoT : Home automation, Industry applications, Environmental applications.	10
<b>Total</b>		<b>45</b>

**List of References:**

1. Michael Margolis, “*Arduino Cookbook*”, First Edition, O’Reilly Media, March 2011.
2. Muhammad Ali Mazidi, SarmadNaimi and SepehrNaimi, “*The AVR Microcontroller and Embedded Systems: Using Assembly and C*”, 1st Edition, Pearson Education, 2012.
3. Michael McRoberts, “*Beginning Arduino*”, 2/E, Apress, 2013
4. Cornel Amariei, “*Arduino Development Cookbook*”, Packt Publishing, 2019.
5. Michael McRoberts, “*Beginning Arduino*”, Second Edition, Apress, 2013
6. Marco Schwartz, “*Internet of Things with ESP8266*”, Packt Publishing Ltd., July 2016
7. Marco Schwartz, “*ESP8266 Internet of Things Cookbook*”, Packt Publishing, 2017

**Course Outcomes (COs) :**

At the end of this course students will be able to ...

1. Recollect basic knowledge about Digital Systems and microcontroller architecture.
2. Understand functions of Arduino pins and illustrate its use.
3. Integrate serial communication for device interfaces and debugging in applications.
4. Make use of sensors for monitoring different quantities in application.
5. Integrate actuators in application for physical movement and control.
6. Understand concepts of IoT and design IoT applications.