

Course Code	Course Title	L	T	P	C
1153EC202	EMBEDDED SYSTEMS AND ROBOTICS	1	0	4	3

**a) Course Category**

Program Elective

**b) Preamble**

This course introduces the embedded hardware design, programming and introduction of robotics, electronic components, electronic processors and controllers, circuit development with practical knowledge of each modules to give our student the best of robotics training for real-time applications.

**c) Prerequisite**

Microprocessor and Microcontroller

**d) Related Courses**

Nil

**e) Course Outcomes**

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on Revised Dave's Taxonomy)
CO1	Demonstrate PIC based embedded systems	S4
CO2	Design and develop real time systems using Arduino	S4
CO3	Design robots using arduino for the given specification and demonstrate it	S4

f)	Correlation of COs with POs													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	L	-	-	L	H	-	L	-	M	L	-	M	H	H
CO2	M	-	H	H	H	-	L	-	H	L	M	H	H	H
CO3	-	-	H	H	H	L	L	L	H	L	-	H	H	H

g) Examination Scheme for practical dominated course										
Internal evaluation							Semester end evaluation			
(40M)							(60M)			
Laboratory experiment (15M)				Model laboratory test (25M)			Part-A (20M)	Part-B (40M)		
Performance in conducting experiment (5)	Result and analysis (3)	Viva Voce (3)	Record (4)	Performance in conducting experiment (15)	Result and analysis (5)	Viva Voce (5)	Theory questions to evaluate the knowledge and understanding (20)	Performance in conducting experiment (25)	Result and analysis (10)	Viva Voce (5)

**g) Course content**

**Theory**

**15 Hours**

PIC-Architecture, pin diagram, ports, on chip peripherals Embedded C programming – General Structure, Data types

Embedded C programming – General Structure, Data types

Arduino- introduction, IDE, different arduino, Boards & shields

Analog I/O & O/p. Serial and Parallel Communication

Microcontroller ATMEGA 328

Seven Segment and LCD Display

Driving motors

Manual Robots and Autonomous Robots - fundamentals and its applications

Gear assembly and calculations.

Different types of chassis designing

## RTOS fundamentals

### i) List of experiments.

S. No	CO Mapping	Practical Exercises (60 Hours)
1.	CO1	LED and seven segment display using PIC- C Programming
2.	CO1	Keypad interface using PIC- C Programming
3.	CO1	Serial communication using PIC-C Programming
4.	CO1	PWM generation using PIC-C Programming
5.	CO1	Motor speed control using PIC
6.	CO2	Interfacing Basic Shield with Arduino
7.	CO2	LED Interfacing using Arduino
8.	CO2	Generating different colors from RGB LED
9.	CO2	LCD Interfacing using Arduino
10.	CO2	LDR Interfacing using Arduino
11.	CO2	IR sensor interfacing using Arduino
12.	CO2	Ultrasound sensor interfacing using Arduino
13.	CO2	Temperature sensor interfacing using Arduino
14.	CO2	Interfacing Motors to Arduino
15.	CO2	Bluetooth Interfacing using Arduino

16.	CO2	WiFi Interfacing using Arduino
17.	CO2	GSM module Interfacing using Arduino
18.	CO3	Color Sensing Robot
19.	CO3	Light Sensing Robot
20.	CO3	Grid Counting Robot
21.	CO3	Range Detecting Robot
22.	CO3	Obstacle Sensing Robot
23.	CO3	Edge Avoiding Robot
24.	CO3	DTMF Controlled Robot
25.	CO3	Bluetooth Controlled Robot
26.	CO3	Wi-Fi Controlled Robot
27.	CO3	GSM Controlled Robot
28.	CO3	Line Follower Robot

Total hrs 75

## h) Learning Resources

### Reference Books

1. Massimo Banzi, "Getting Started with Arduino" 2 nd edition. O'Reilly, 2011
2. Udayakumar, G.Kulkarni, " Arduino: A Begineer's Guide" 2017
3. DoganIbrahi, "Advanced PIC Microcontroller Projects in C", Newnes, 2008
4. MykePredko, "Programming and customizing the PIC", 3 rd edition
5. Parab, V.G.Shelake and R.K.Kamat-"Exploring C for Microcontrollers: A Hands on Approach"- Springer-2007
6. M. ShohamA Textbook of Robotics 1: Basic Concepts Springer-1984
7. By Kevin M. Lynch, Frank C. Park "Modern Robotics mechanics, planning, controls" Cambridge university press-2017

## Online Resources

1. <https://www.arduino.cc/>
2. <https://www.tutorialspoint.com/arduino/index.html>
3. <http://microcontrollerslab.com/pic-microcontroller-compiler/>
4. <http://bobblick.com/techref/techref.html>
5. <http://www.microcontrollerboard.com/pic-microcontroller-books.html>
6. <http://www.nex-robotics.com/products/microcontroller-development-boards/atmega2560-microcontroller-socket.html>
7. [http://www.avr-asm-download.de/beginner\\_en](http://www.avr-asm-download.de/beginner_en)