

Course Code	Course Title	L	T	P	C
1152EC237	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 Outcome**

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

CO Nos.	Course Outcomes	Skill Level (Based on 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)

#### h) 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**

<b>S. No</b>	<b>CO Mapping</b>	<b>Practical Exercises (60 Hours)</b>
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 75hrs

#### **j) Learning Resources**

##### **Textbooks**

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.

8. Cameron Hughes, Tracey Hughes "Robot Programming: A Guide to Controlling Autonomous Robots", 1/e First Edition-2016.
9. John-David Warren, Josh Adams, HaraldMolle, "Arduino Robotics" apress.

#### **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)