Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

AY 2023-24

Course Information

Programme	M.Tech. (Electronics Engineering)
Class, Semester	First Year M.Tech., Sem II
Course Code	7OE508
Course Name	Open Elective - Introduction to Embedded Systems
Desired Requisites:	None

Teaching Scheme		**Examination Scheme (Marks)**			
Lecture	3 Hrs/week	**MSE**	**ISE**	**ESE**	**Total**
Tutorial	-	30	20	50	100
Practical	-	Nil			
Interaction	-	**Credits: 3**			

Course Objectives

1	To introduce Embedded Systems and their applications
2	To develop understanding about Microcontrollers
3	To introduce hardware components of Embedded Systems
4	To explain fundamentals of Arduino
5	To explore Arduino based applications and programming

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO1	**Understand** Embedded Systems and Identify their applications	Apply
CO2	**Develop** knowledge about hardware and software of Embedded Systems	Apply
CO3	**Analyze** Arduino based systems and their programming	Analyze
CO4	**Explore** and learn Arduino based systems applications	Apply

Module	**Module Contents**	**Hours**
I	**Module 1 Introduction** Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems Characteristics and Applications of embedded systems: operational and non-operational quality attributes. Embedded Systems Applications-Application specific – washing machine, domain specific - automotive	7
II	**Module 2 Core of embedded systems** Microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components.	7

III	**Module 3 Embedded Hardware** Memory map, i/o map, interrupt map, processor family, external peripherals, memory – RAM , ROM, types of RAM and ROM, memory testing, CRC ,Flash memory. **Peripherals:** Control and Status Registers, Device Driver, Timer Driver - Watchdog Timers	7
IV	**Module 4 Introduction to Arduino** Arduino device,Features of Arduino, Components of Arduino board,Description of Microcontrollers, Installation of Arduino IDE on Ubuntu Linux OS Run the arduino executable file, Using IDE to prepare Arduino sketch, Uploading and running the sketch,Program notation: variables, functions, control flow, Arduino conventions.The concept of a program variable.Numerical values and basic numerical operators.if/then/else Iteration using for loops.Real world timing and the delay() function	7
V	**Module 5 Input/Ouput Progrmming** Sensor Inputs:- Definition, Types. Interfacing arduino to different sensors- light sensor, temperature sensor, humidity sensor, pressure sensor sound sensor, distance ranging sensor, water/detector sensor, smoke, gas, alcohol sensor, ultrasonic range finder ,Displays: Basics of LED's and LCD's. Interfacing arduino to LED's- blinking single LED, blinking multiple LED's, 7 segment display , traffic light ,LED flashes ,LED dot matrix ,pulsating lamp. Interfacing to LCD's- Basic LCD control, LCD temperature control, display a message on LCD screen, scrolling of text Touch screens, Reading and writing to SD card	7
VI	**Module 6 Arduino Applications** Case studies : Arduino based robot car , Arduino based PLC, industrial application	4

Text Books	
1	Shibu K V , "Introduction to embedded systems", Tata Mcgraw-Hill, 1st edition
2	"Arduino Cookbook,"Michael Margolis

References	
1	"Embedded Systems", Rajkamal, Tata Mcgraw-Hill
2	"Beginning Arduino", Michal Mc Roberts, Second Edition
3	Michal Mc Roberts "Beginning Arduino" Second Edition, Technology in Action

Useful Links	
1	NPTEL Lectures
2	

CO-PO Mapping															
	Programme Outcomes (PO)														
	1	2	3	4	5	6									
CO1			2												
CO2						3									
CO3			3			2									
CO4				2		2									
The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High Each CO of the course must map to at least one PO.															

Assessment
The assessment is based on MSE, ISE and ESE. MSE shall be typically on modules 1 to 3. ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be quiz, seminar, assignments or any interactive activity etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6. For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)