Course Code	Course Title	L	T	P	C
MCOA506P	Real Time Embedded Systems Lab	0	0	2	1
Pre-requisite	NIL	Syllabus version			
		1.0			

Course Objectives

1. Acquire programming and hardware skills in typical embedded system development cycle
2. Demonstrate the different embedded system design concepts using cortex-M microcontroller

Course Outcomes

On completion of this course, the students will be able to:

1. Use modern software and hardware development tools for embedded system design
2. Develop embedded system to solve real world control and automation problems

Indicative Experiments

1.	Implementation of simple C programming concepts in IDE: Bitwise operations, control blocks and functions
2.	GPIO Programming: Interfacing input and output devices
3.	Study of polling and interrupts using a Cortex-M microcontroller
4.	Generation of PWM signals for the given frequency and duty cycle using timers
6.	Implementation of analog interfacing using ADC Programming with potentiometer
6.	Measurement of voltage and current for data acquisition system design
7.	Measurement of process variables: Temperature, level, position and speed
8.	Interfacing I2C based 3-axis accelerometer sensor
9.	Implementation of CAN network and analysis using logic analyzer
10.	Implementation of digital FIR filter and FFT in Cortex-M microcontrollers
11.	Design and implementation of real-time PID control system for speed or position control of motor
12.	Pre-emptive task scheduling using RTOS kernel for multitasking applications

Total Laboratory Hours **30 hours**

Mode of assessment: Continuous assessment, FAT

Text Book

1.	Alexander G Dean, Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers: A Practical Approach, ARM Education Media, 2021.
2.	Jonathan W. Valvano, Embedded Microcomputer Systems: Real Time Interfacing, Third Edition, Cengage Learning, 2010.

Reference Books

1.	Yifeng Zhu, Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C, Third Edition, 2018.
2.	Geoffrey Brown, Discovering the STM32 Microcontroller, Indiana University, 2016.

Mode of Evaluation: Assignment, FAT

Recommended by Board of Studies	09-07-2022		
Approved by Academic Council	No. 67	Date	08-08-2022