

## 2. Guidelines for Assessment of Mini Project Practical/Oral Examination:

- a. Report should be prepared as per the guidelines issued by the University of Mumbai.
- b. Mini Project shall be assessed through a presentation and demonstration of working model by the student project group to a panel of Internal and **External Examiners preferably from industry or research organisations** having experience of more than five years approved by head of Institution.

### Students shall be motivated to present their mini project work done

1. Participate in Project Competition
2. Publish paper in Conferences/Journals.

| Module No. | Unit No. | Detailed Content   | Hours     |
|------------|----------|--|-----------|
| <b>1</b>   |          | <b>Introduction</b>  | <b>8</b>  |
|            | 1.1      | Definition of Embedded System, Embedded Systems Vs General Computing Systems, Classification, Major Application Areas. Characteristics and quality attributes (Design Metric) of embedded system.  |           |
|            | 1.2      | Identification of Project Title  |           |
| <b>2</b>   |          | <b>Controller boards and Programming – Embedded C</b>  | <b>8</b>  |
|            | 2.1      | ARM LPC 21XX (2148), STM32 boards and Texas MSP 430 lunchbox/ Tiva C board and <b>PIC/PSoc*</b>  |           |
|            | 2.2      | Comparison of C and embedded C, Data Types, Variable, Storage Classes, Bit operation , Arrays, Strings, Structure and unions, Classifier   |           |
|            | 2.3      | <b>Exercise:</b> Identify the suitable board required for the particular application with respect to design metrics.<br>( <b>Hint:</b> check clock frequency (speed) , memory (program and data), no. of ports for peripherals, timers/counters and serial communication requirement for project)  |           |
|            | 2.4      | <b>Suggested Way to Identify :</b> <a href="https://predictabledesigns.com/how-to-select-the-microcontroller-for-your-new-product/">https://predictabledesigns.com/how-to-select-the-microcontroller-for-your-new-product/</a>   |           |
| <b>3</b>   |          | <b>Interfacing Sensors and peripherals using Embedded C</b>  | <b>10</b> |
|            | 3.1      | Sensors and Signal Conditioning Circuits amplifiers /attenuators /filters /comparators/ADC and DAC) , Interfacing with GLCD/TFT display , Relays and Drivers for interfacing Motors (DC and stepper )  |           |
|            | 3.2      | Interfacing with BLDC motors and drivers, USB/HDMI camera interfacing  |           |
|            | 3.3      | <b>Exercise :</b> Understand the Interfacing requirement like drivers, signal condition circuits for sensors, etc. for the selected application  |           |
|            | 3.4      | <b>Study Material : For LCD interfacing with MSP430 LaunchPad</b><br><a href="https://microcontrollerslab.com/lcd-interfacing-msp430-launchpad/#:~:text=LCD%20interfacing%20with%20MSP430%20microcontroller,Now%20I%20will&amp;text=It%20requires%205%20volts%20dc,and%20second%20pin%20is%20vcc.">https://microcontrollerslab.com/lcd-interfacing-msp430-launchpad/#:~:text=LCD%20interfacing%20with%20MSP430%20microcontroller,Now%20I%20will&amp;text=It%20requires%205%20volts%20dc,and%20second%20pin%20is%20vcc.</a> |           |
| <b>4</b>   |          | <b>Communication with programming in Embedded C</b>  | <b>10</b> |
|            | 4.1      | Serial communication, CAN bus, I2C, MOD bus, SPI   |           |
|            | 4.2      | Interfacing with Wi-Fi, Bluetooth ,ZigBee, LoRa, RFID and putting data on IoT  |           |
|            | 4.3      | Interfacing with GSM module , GPS module, SD card  |           |
|            | 4.4      | <b>Exercise:</b> Understand Communication requirement for selected application and test it   |           |