**Module: Micro Controller Unit**  **Total Hours: 48**

**EI SME: Chintan Chauhan**

**EI SPOC: Kalpesh Balar**

**EI Leader: Bhavin Patel**

**Grade Policy:**

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| **Sr. No** | **Module** | **Ratio** |
| 1 | Quiz | 20% |
| 2 | Group Project/Certification | 30% |
| 3 | Assignment | 20% |
| 4 | Attendance | 10% |
| 5 | Final Quiz | 20% |

Pre-requisites: Basics of Electronics and programming.

**Expected Outcomes:**

* Understand the fundamentals concepts of MCU, Protocols and RTOS
* Extensively write programs for RTOS and Protocols.

**Contents with Hrs**

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| **Sr. No** | **Contents** | **Hours** |
|  | Session 1: Introduction to Microcontrollers  Microcontroller Architecture  Special Function Registers (SFR)  Type of Memories & their usage  Session 2: Diving into STM32 Microcontroller  Introduction to ARM  Using CubeMX to configure the Pin Mux & peripherals against schematic  Using CubeMX & Keil IDE to compile, load & debug the program  STM32 IoTKit Schematic Understanding  Test a simple program to blink the LED  Demonstrating a simple interrupt with the switch  Session 3: Introduction to RTOS  Need for RTOS  Bare Metal Vs RTOS  Configure FreeRTOS for STM32  Understand the FreeRTOS directory structure  Create a simple task & execute on the FreeRTOS  Session 4: Multithreaded Application with RTOS  Creating multiple tasks in an application  Deleting the tasks  Various Synchronization mechanisms to manage the concurrency  Synchronization between an interrupts & Task  FreeRTOS Queue Management  Designing & Testing an application with switches & LEDs  Session 5: Protocols  Inter Integrated Circuit (I2C)  LCD interfacing with I2C  UART & USART  Ethernet  USB  Session 6: RTOS Project  Understanding the project requirements  Low level design – Decide on the number of tasks, their priority & interaction  Buffer management  Implementing the project  Session 7: Memory Management  Need for Memory Management  Profiling  Linker script & Map file | 48 |

**Software / Hardware Tools Required:** Hardware kits along with accessories are required.

Certification Exam (Yes / No): No