**20EC32P3 – EMBEDDED SYSTEMS & IOT LAB**

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|  **Course Category:** | Program Core | **Credits:** | 2 |
| **Course Type:** | Practical | **Lecture-Tutorial- Practice:** | 0 - 0 - 3 |
| **Prerequisite:** |  Micro controllers and embedded systems | **Sessional Evaluation:****External Evaluation :****Total Marks:** | 4060100 |

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| **Course****Objectives** | Students undergoing this course are expected to understand: |
| 1. Use Embedded C language to develop embedded applications.
2. Apply, Construct and demonstrate various in-build interfaces/modules of Aurdino and MSP430 for specific applications.
3. Apply Embedded C code for utilizing Low power modes of MSP430.
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| **Course Outcomes** | Upon successful completion of the course , the students will be able to: |
| CO1 | Design the home appliances and toys using Microcontroller chips. |
| CO2 | Design Logic controller module and SIDU module. |
| CO3 | Design the high speed communication circuits using serial bus connection |
| CO4 | Interfacing and programming GPIO ports in c using MSP430  |
| CO5 | Understand the PWM generation using timer on MSP430 GPIO |
| CO6 | Know how to connect and communicate to cloud |
| **Course****Content****Course****Content** | **LIST OF EXPERIMENTS**1. BASIC LED PROGRAMMING IN C USING AURDINO * 1. Study and Install IDE of Arduino and different types of Arduino

 1.2 Write program using Arduino IDE for Blink LED 1.3 Write Program for RGB LED using Arduino2. INTERFACING AND PROGRAMMING GPIO PORTS IN C USING MSP430  2.1: Blink LED 2.2: Fade RGB LED (PWM) 2.3:Push Button (Input)3. INTERFACING AND PROGRAMMING GPIO PORTS IN C USING MSP430  3.1: Multiple LED (Many Outputs) 3.2:Shift Register (Integrated Circuit) 3.3: Photoresistor (Light Sensor)4. INTERFACING AND PROGRAMMING GPIO PORTS IN C USING MSP430  4.1: Spin the Motor 4.2: Seven-Segment Display (Digital Display)5. A BASIC WI-FI APPLICATION – COMMUNICATION BETWEEN TWO  SENSOR NODES 6. INTERFACING POTENTIOMETER WITH MSP430 6.1: Alter the threshold to 75% of Vcc for the LED to turn on.  6.2: Modify the code to change the Reference Voltage from Vcc to 2.5V.7. CONNECT AND COMMUNICATE TO CLOUD 7.1: Creating a simple HTML web server using MSP430 Launch Pad& CC3100  Wi-Fi Booster Pack 7.2: Create a Wi-Fi-connected IOT sensor that calls you when sensor values exceed  a threshold8. CONNECT AND COMMUNICATE TO CLOUD 8.1: Playing Music – (Buzzer) 8.2: Potentiometer – (Rotary Angle Sensor)9. PWM GENERATION USING TIMER ON MSP430 GPIO 9.1: Observe the PWM waveform on a particular pin using CRO.  9.2: What is the maximum resolution of PWM circuitry in MSP430G2 Launch Pad?  9.3: Change the above code to create a PWM signal of 75% duty cycle on particular  PWM pin.10. PWM BASED SPEED CONTROL OF MOTOR CONTROLLED BY  POTENTIOMETER CONNECTED TO MSP430 GPIO 10.1: Interface a Stepper motor with MSP-EXP430G2 Launch Pad to run it in a  Predetermined uniform speed.  10.2: Describe the applications of PWM in a digital power supply control.  10.3: Create Switch case code from the example code to run the DC Motor in 3 set  of Speeds.11. A BASIC WI-FI APPLICATION 11.1: In the terminal output window, we have received a debug message  “Pinging…!” Search in the code and change the message to “Pinging the  Website”. Repeat the experiment to observe this change in the Serial  Window. 12. INTERRUPT PROGRAMMING EXAMPLES THROUGH GPIOS 12.1: Write the code to enable a Timer interrupt for the pin P1.1.  12.2: Write the code to turn on interrupts globally. |

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| **Contribution of Course Outcomes towards achievement of Program Outcomes** |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | - | - | 1 | - | 2 | 3 | 3 |
| CO2 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | - | - | - | - | 2 | 3 | 2 |
| CO3 | 3 | 3 | 3 | 1 | 2 |  1 |  1 |  - |  - |  2 |  - |  2 | 2 | 3 |
| CO4 | 3 | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | 2 | 2 | 3 |
| CO5 | 3 | 3 | 2 | 2 | 2 | 2 | - | - | - | 1 | - | 2 | 3 | 2 |
| CO6 | 3 | 3 | 2 | 2 | 2 | 1 | - | - | - | 1 | - | 2 | 3 | 2 |