



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

## COURSE CONTENT

### EMBEDDED SYSTEM DESIGN LABORATORY

**VII Semester: ECE**

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		CIA	SEE	Total
AECC53	Core	-	-	3	1.5	30	70	100
<b>Contact Classes: Nil</b>	<b>Tutorial Classes: Nil</b>	<b>Practical Classes: 36</b>			<b>Total Classes: 36</b>			

**Prerequisites: Microprocessors and Microcontrollers**

#### I. COURSE OVERVIEW:

This laboratory course is intended to train the students on various embedded modules and embedded C language. This course provides hands-on experience of programming on input/output (I/O) devices and Keil  $\mu$  Vision tool. The lab allows students to learn the interfacing of input/output (I/O) devices to increase student interest and develop skills to build embedded systems.

#### II. COURSE OBJECTIVES:

**The students will try to learn:**

- I. The demonstration of Keil IDE tool and 8051 Microcontroller Development Kit for the implementation of embedded systems.
- II. The interfacing of I/O devices with 8051 microcontroller using embedded C language.
- III. The interfacing of analog to digital converters (ADC) and digital to analog converters (ADC) with 8051 microcontroller to convert signals from one form to another form.

#### III. COURSE SYLLABUS:

##### Week-1: DEVELOP PROGRAM USING KEIL IDE TOOL

Design and develop a reprogrammable embedded computer using 8051 microcontrollers and to show the following aspects.

- a. Programming
- b. Execution
- c. Debugging

To Demonstrate the Tool Chain for Keil IDE (Embedded Systems Development Tool Chain) with the example of LED Blinking Program.

##### Week-2: INTERFACING LED WITH DIFFERENT PORT PINS

- a) Program to toggle all the bits of port P1 continuously with 250 ms delay
- b) Program to toggle only the bit P1.5 continuously with some delay

##### Week-3: INTERFACING BUZZER AND SWITCH

Program to interface a switch and a buzzer to two different pins of a port such that the buzzer should sound as long as the switch is pressed.

##### Week-4: INTERFACING LCD DISPLAY

Program to interface LCD data pins to port P1 and display a message on it using P89V51RD2

##### Week-5: INTERFACE HEXA KEYPAD

Program to 4\*4 interface keypad. Whenever a key is pressed, it should be displayed on LCD

##### Week-6: INTERFACE SEVEN SEGMENT DISPLAY

Program to interface seven segment display using 89V51RD2

##### Week-7: SERIAL COMMUNICATION INTERFACING

Program for serial communication between Microcontroller to PC communication the data should be transferred from microcontroller to PC terminal window using 89V51RD2

##### Week-8: SERIAL COMMUNICATION INTERFACING

Program for serial communication between PC to Microcontroller communication the data should be transferred from PC to Microcontroller terminal window using 89V51RD2

**Week-9: INTERFACING WITH TEMPERATURE SENSOR**

Program to develop necessary interfacing circuit to read data from Temperature sensor and process using P89V51RD2, the data has to display terminal window

**Week-10: INTERFACING STEPPER MOTOR**

Program to interface Stepper Motor to rotate the motor in clockwise and anticlockwise directions

**Week-11: INTERFACING MULTIPLE DEVICES**

Program to verify run 2 to 3 tasks simultaneously on P89V51RD2 SDK. Use LCD interface, LED interface, Serial communication.

**Week-12: INTERFACE ADC DEVICE**

Program to interface ADC device with P89V51RD2 and display value on LCD

**Week-13: INTERFACE DAC DEVICE**

Program to interface DAC device with P89V51RD2 and observe the analog output in CRO

**Week-14: INTERFACE RELAY**

Program to interface Relay with P89V51RD2 using transistor

**Week-15: INTERRUPT**

Program to toggle LEDs using simple INTERRUPT

**IV. TEXT BOOKS**

1. Shibu K.V, "Introduction to Embedded Systems", Tata McGraw Hill Education Private Limited, 2<sup>nd</sup> Edition, 2009.
2. Raj Kamal, "Embedded Systems: Architecture, Programming and Design", Tata McGraw-Hill Education, 2<sup>nd</sup> Edition, 2011.
3. Andrew Sloss, Dominic Symes, Wright, "ARM System Developer's Guide Designing and Optimizing System Software", 1<sup>st</sup> Edition, 2004.

**V. REFERENCE BOOKS**

1. Lyla B Das, "Embedded Systems", Pearson Education, 1<sup>st</sup> Edition, 2012.
2. Michael J. Pont, "Embedded C", Pearson Education, 2<sup>nd</sup> Edition, 2008.
3. Raj Kamal, "Embedded Systems: Architecture, Programming and Design", Tata McGraw-Hill Education, 2<sup>nd</sup> Edition, Tata McGraw Hill, 2011.

**VI. WEB REFERENCES:**

1. <https://www.inorobotics.com/8051-microcontroller>
2. <https://electrosome.com/led-blinking-8051-microcontroller-keil-c-tutorial-at89c51/>
3. [http://www.8051projects.net/wiki/Keil\\_Embedded\\_C\\_Tutorial](http://www.8051projects.net/wiki/Keil_Embedded_C_Tutorial)