



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE DESCRIPTOR

Course Title	EMBEDDED SYSTEM LABORATORY				
Course Code	AEC111				
Programme	B.Tech				
Semester	VII	ECE			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	Theory			Practical	
	Lectures	Tutorials	Credits	Laboratory	Credits
	-	-	-	3	3
Chief Coordinator	Mrs. M. Lavanya, Assistant Professor				
Course Faculty	Mr.B. Naresh, Assistant Professor Mrs. N. Anusha, Assistant Professor Mr. Mohd.Khadir, Assistant Professor				

I. COURSE OVERVIEW:

This laboratory course builds on the lecture course "Embedded Systems" which is mandatory for all students of electronics and communication engineering. The course aims at practical experience with the programming of different I/O devices using embedded C and keil tool .

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	AEC013	VI	Microprocessors and Microcontrollers	4

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Embedded System Laboratory	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✗	Chalk & Talk	✗	Quiz	✗	Assignments	✗	MOOCs
✓	LCD / PPT	✗	Seminars	✗	Mini Project	✗	Videos
✗	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

Semester End Examination (SEE): The semester end lab examination for 70 marks shall be conducted by two examiners, one of them being Internal Examiner and the other being External Examiner, both nominated by the Principal from the panel of experts recommended by Chairman, BOS.

The emphasis on the experiments is broadly based on the following criteria:

20 %	To test the preparedness for the experiment.
20 %	To test the performance in the laboratory.
20 %	To test the calculations and graphs related to the concern experiment.
20 %	To test the results and the error analysis of the experiment.
20 %	To test the subject knowledge through viva – voce.

Continuous Internal Assessment (CIA):

CIA is conducted for a total of 30 marks (Table 1), with 20 marks for continuous lab assessment during day to day performance, 10 marks for final internal lab assessment.

Table 1: Assessment pattern for CIA

Component	Laboratory		Total Marks
Type of Assessment	Day to day performance	Final internal lab assessment	
CIA Marks	20	10	30

Continuous Internal Examination (CIE):

One CIE exams shall be conducted at the end of the 16th week of the semester. The CIE exam is conducted for 10 marks of 3 hours duration.

Preparation	Performance	Calculations and Graph	Results and Error Analysis	Viva	Total
2	2	2	2	2	10

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Lab related Exercises
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	2	Lab related Exercises
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	2	Lab related Exercises

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	Professional Skills: An ability to understand the basic concepts in Electronics & Communication Engineering and to apply them to various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of complex systems.	2	Lab related Exercises
PSO 2	Problem-Solving Skills: An ability to solve complex Electronics and communication Engineering problems, using latest hardware and software tools, along with analytical skills to arrive cost effective and appropriate solutions.	-	-
PSO 3	Successful Career and Entrepreneurship: An understanding of social-awareness & environmental-wisdom along with ethical responsibility to have a successful career and to sustain passion and zeal for real-world applications using optimal resources as an Entrepreneur.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Demonstrate Keil IDE tool for development of Embedded system.
II	Program the interfacing of various devices with 8051 using Embedded C.
III	Develop program for implementation of interrupts and serial communications.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AEC111.01	CLO 1	Understand the keil environment and programming concepts.	PO 1 PO 5	3
AEC111.02	CLO 2	Develop the interfacing concepts like LED blinking.	PO 1 PO 2	3
AEC111.03	CLO 3	Understand the programming concepts of buzzer and switch.	PO 1 PO 5	3
AEC111.04	CLO 4	Understand the programming concepts of LCD.	PO 1 PO 2	2
AEC111.05	CLO 5	Understand the programming concepts of hexa Keypad.	PO 5	2
AEC111.06	CLO 6	Develop the interfacing concepts like seven segment display, stepper motor.	PO 1 PO 2	2
AEC111.07	CLO 7	Analyse the Program for serial communication between Microcontroller to PC and vice versa.	PO 2 PO 5	2
AEC111.08	CLO 8	Analyse the Program to develop necessary interfacing circuit to read data from I/O devices.	PO 5	2
AEC111.09	CLO 9	Develop the interfacing concepts like LCD, LED using P89V51RD2 SDK.	PO 5	2
AEC111.10	CLO 10	Develop the interfacing concepts like ADC and DAC using P89V51RD2 SDK.	PO 2	2
AEC111.11	CLO 11	Analyze and Develop the interfacing of Relay using P89V51RD2 SDK.	PO 5	1
AEC111.12	CLO 12	Develop a Program to toggle LEDS using simple interrupt.	PO 1	3

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3				2								1		
CLO 2	2	3											1		
CLO 3	3				3								1		
CLO 4	2				2								2		
CLO 5					2								3		
CLO 6	2	2											1		
CLO 7		2			2								2		
CLO 8					2								1		
CLO 9		3			2								2		
CLO 10		2											1		

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 11					1								2		
CLO 12	3												2		

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1, PO 2 PO 5,PSO1	SEE Exams	PO 1, PO 2 PO 5,PSO1	Assignments	-	Seminars	-
Laboratory Practices	PO 1, PO 2 PO 5,PSO1	Student Viva	PO 1, PO 2 PO 5,PSO1	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES - INDIRECT

✓	Early Semester Feedback	✓	End Semester OBE Feedback
✗	Assessment of Mini Projects by Experts		

XIII. SYLLABUS

LIST OF EXPERIMENTS	
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
a)Program to interface seven segment display using 89V51RD2 b) Program to toggle LEDS using simple INTERRUPT	

Week-7	SERIAL COMMUNICATION INTEFACING
Program for serial communication between Microcontroller to PC communication the data should be transfer from microcontroller to PC terminal window using 89V51RD2	
Week-8	SERIAL COMMUNICATION INTEFACING
Program for serial communication between PC to Microcontroller communication the data should be transfer from PC to Microcontroller terminal window using 89V51RD2	
Week-9	INTERFACING WITH TEMPERATURE SENSOR
Program to develop necessary interfacing circuit to read data from I) 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
a) Program to verify run 2 to 3 tasks simultaneously on P89V51RD2 SDK. Use LCD interface, LED interface, Serial communication. b) Program to interface Relay with P89V51RD2 using transistor	
Week-12	INTERFACE ADC DEVICE
a) Program to interface ADC device with P89V51RD2 and display value on LCD b) Program to interface DAC device with P89V51RD2 and observe the analog output in CRO	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Week No.	Topics to be covered	Course Learning Outcomes	Reference
1	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.	CLO 1	T1-2.1 to 2.7
2	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	CLO 2	T1-20.1 to 20.2
3	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.	CLO 3	T1-8.1 to 8.2
4	Program to interface LCD data pins to port P1 and display a message on it using P89V51RD2	CLO 4	T1-8.3 to 8.7
5	Program to 4*4 interface keypad. Whenever a key is pressed, it should be displayed on LCD	CLO 5	T1-10.1 to 10.10
6	Program to interface seven segment display using 89V51RD2, Program to toggle LEDs using simple INTERRUPT	CLO 12	T1-10.11 to 10.13
7	Program for serial communication between Microcontroller to PC communication the data should be transfer from microcontroller to PC terminal window using 89V51RD2	CLO 7	T1-11.1 to 11.5

Week No.	Topics to be covered	Course Learning Outcomes	Reference
8	Program for serial communication between PC to Microcontroller communication the data should be transfer from PC to Microcontroller terminal window using 89V51RD2	CLO 7	T1-11.1 to 11.5
9	Program to develop necessary interfacing circuit to read data from I) Temperature sensor and process using P89V51RD2, the data has to display terminal window	CLO 8	T1 –11.12
10	Program to interface Stepper Motor to rotate the motor in clockwise and anticlockwise directions	CLO 6	T1-10.11 to10.13
11	Program to verify run 2 to 3 tasks simultaneously on P89V51RD2 SDK. Use LCD interface, LED interface, Serial communication,Relay using transistor	CLO 9, CLO11	T1–17.1 to 17.6
12	Program to interface ADC,DAC device with P89V51RD2 and display value on LCD	CLO 10	T1–14.1 to 14.3

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S NO	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Implementing the algorithm for the elevator controller.	Seminars	PO 1, PO 2	PSO 1
2	Executing the program for the elevator controller.	Seminars / NPTEL	PO 2, PO5	PSO 1

Prepared by:

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