



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

ARM CORTEX ARCHITECTURE AND PROGRAMMING LABORATORY							
II Semester: M. TECH-ES							
Course Code	Category	Hours / Week			Credits	Maximum Marks	
BESE24	Core	L	T	P	C	CIA	SEE
		-	-	4	2	40	60
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45			Total Classes: 45		
Prerequisite: Embedded C.							

I. COURSE OVERVIEW:

This laboratory course is designed to provide students with practical experience in designing and implementing ARM Cortex Architecture and Programming Laboratory. The following experiments are to be performed on ARM Cortex - M TM4C123 Microcontroller using Embedded C.

II. COURSES OBJECTIVES:

The students will try to learn

- I. Writing embedded C programs for ARM microcontrollers.
- II. Using Sy stick counter of ARM microcontrollers.
- III. Programming the interrupts of ARM microcontrollers
- IV. Interfacing sensors with ARM microcontrollers

III. COURSE OUTCOMES:

At the end of the course students should be able to:

- CO 1 Develop embedded C programs for ARM microcontrollers
- CO 2 Develop embedded C programs for transmit & receive data using UART
- CO 3 Develop embedded C programs for delay functions using timers
- CO 4 Develop embedded C programs for interfacing sensors with ARM microcontrollers
- CO 5 Develop Embedded Systems with “ARM Cortex M4” powered “STM32” Microcontroller.
- CO 6 Learn how to interpret the content of a message received through UART.

IV. LISTOFEXPERIMENTS:

WEEK-1: LED BLINKING

Program to toggle all the led to port and with some time delay.

WEEK-2: INTERFACING OF LCD

Interface LCD to ARM7 and display message on screen.

WEEK-3: INTERFACING OF KEYPAD

Interface keypad with ARM7.

WEEK-4: INTERFACING OF LED

Interface LED with ARM7.

WEEK-5: INTERFACING OF STEPPER MOTOR

Stepper motor interfacing.

WEEK-6: INTERFACING OF DC MOTOR

DC motor interfacing.

WEEK-7: PROGRAMMABLE GAIN AMPLIFIER

Study and characterization of the Programmable Gain Amplifier (PGA): Gain Bandwidth Product.

WEEK-8: FILTERS

Realization of Low pass, High pass and Band pass filters and their characterization.

WEEK-9: ADC AND DAC

Experiments with on-chip ADC's and DAC's.

WEEK-10: DIGITAL FUNCTION IMPLEMENTATION

Digital Function Implementation using Digital Blocks.

- a. Timer experiment
- b. Counter for blinking LED
- c. PWM experiment
- d. Digital buffer and digital inverter.

WEEK-11: ALU OPERATIONS

Logical/Arithmetic function implementation using Microcontroller.

WEEK-12: TIMER

Timer operation in different Modes.

WEEK-13: INTERFACE A 4X4 KEYBOARD AND DISPLAY THE KEY CODE ON AN LCD

Interface a 4x4 keyboard and display the key code on an LCD

WEEK-14: DISPLAY THE HEX DIGITS 0 TO F ON A 7-SEGMENT LED INTERFACE

Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between.

V. TEXT BOOKS:

1. Microcontroller Based Embedded Systems Laboratory Manual, Steve Furber, ARM System on ChipArchitecture, 2nd edition, New Delhi: Dorling Kindersley (India) Pvt. Ltd., 2000.

VI. REFERENCE BOOKS:

1. Muhammad Ali Mazidi, Shujen Chen, Sarmad Naimi, Sepehr Naimi, TI ARM Peripherals Programming and Interfacing Using C Language for ARM Cortex, Mazidi and Naimi, 2014.
2. Jonathan Valvano, Embedded Systems: Real-Time Operating Systems for Arm Cortex Microcontrollers, Charleston: Create Space Independent Publishing Platform, 2012.

VI. MATERIALS ONLINE

1. Course Template
2. Laboratory Manual