INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

EMBEDDED SYSTEM PROGRAMMING

I Semester: ES

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BESE01	Core	3	-	-	3	40	60	100

Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 45

Prerequisite: Digital Image Processing and Embedded Systems.

I. COURSE OVERVIEW:

An embedded system programming course typically covers designing, programming, working with embedded systems. Embedded C is an extension to the standard C Programming Language. It focuses on the knowledge and skills required to define the functionality of the embedded systems.

II. COURSES OBJECTIVES:

The students will try to learn

I.   The importance of embedded C and microcontrollers to design real time timers with various constraints
II. Writing, compiling, and debugging code for embedded systems.
III. Techniques for debugging and testing both software and hardware components of embedded systems.
IV. To interface with input and output devices, as well as communication interfaces commonly
     used in embedded Systems.

III. COURSE OUTCOMES:

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

CO1   Summarize the concepts of embedded C and develop the embedded C programming examples with Keil IDE and interfacing modules.

CO2   Choose serial or parallel communication for transmitting the data between microcontroller and peripherals.

CO3   Develop Embedded C language programs for, blinking the LED and interfacing of switch, LCD display, buzzer and temperature sensors to the microcontrollers.

CO4   Build an interface between micro controller and peripherals to provide solutions to the real world problems.

CO5   Make use of debugging techniques in embedded software to know step- by-step software execution process.

CO6   Develop embedded system programming for different peripherals to increase the code density.

IV. COURSE CONTENT:

MODULE - I: EMBEDDED C PROGRAMMING (9)

Introduction to 'C' programming, Difference between C & Embedded C, storage Classes, Data Types Controlling program flow, Arrays, Functions, Memory Management, Pointers, Arrays and Pointers, Pointer to Functions and advanced topics on Pointers, Structures and Unions, Data Structures, Linked List, Stacks, Queues Conditional Compilation, Pre-processor directives, File operations, Bitwise operations, Typecasting.

MODULE –II: TIMERS & COUNTERS AND SERIAL COMMUNICATION PROGRAMMING (9)
Introduction to Timers & Counters, Difference between Timer and Counter, Description of SFR associated with Timers & Counters, Programming of Timers & Counters.
Introduction to Serial Communication, Types of Serial Communication, Description of SFR associated with Serial
Communication, Programming of UART

MODULE –III: PROGRAMMING FOR EXTERNAL INTERFACES (9)
Interfacing Circuit Description of LED's, Programming of LED's Interfacing, Interfacing of Seven Segment Display, Programming of 7 Segment Display Interfacing, Interfacing Circuit Description of 16 x 2 LCD, Programming of 16 x 2 LCD.

Interfacing Circuit of Switches & Keyboard Matrix, Programming of Keyboard Matrix & Switches, Programming & Controlling of motors in Embedded System.

MODULE –IV: EMBEDDED SYSTEM DEVELOPMENT (9)
The integrated development environment, Types of files generated on cross compilation, Simulators. Emulators and debugging, Target hardware debugging, Boundary Scan, Embedded software development and tools. Testing on host machine.

MODULE –V: CASE STUDIES (9)
Design of Embedded Systems using Microcontrollers for applications in the area of communication and automotive. (GSM/GPRS, CAN, ZigBee).

V. TEXT BOOKS:
1. Michael J. Pont, "Embedded C", A Pearson Education, 2nd Edition, 2009.
2. RajKamal, "Embedded Systems, Architecture Programming and Design", Tata McGraw Hill, 2nd
   Edition, 2008.

VI. REFERENCE BOOKS:
1. Jonathan W. Valvano – Brookes / Cole, "Embedded Microcomputer Systems, Real Time Interfacing", Thomas
2. Learning, 1st Edition, 1998.

VII. WEB REFERENCES:
1. http://www.nptelvideos.in/2012/11/embedded-systems.html
2. http://nptel.iitg.ernet.in/courses/Elec_Engg/IIT%20Delhi/Embedded%20Systems%20(Video).html
3. http://www.sciencedirect.com/science/book/9780750677929
4. https://books.google.co.in/books/about/Embedded_systems.html?id=tgLm2g8KnH0C

VIII.   MATERIALS ONLINE:
1. Course Template
2. Tutorial Question Bank
3. Assignments
4. Model Question Paper – I
5. Model Question Paper - II
6. Lecture Notes
7. Power point presentation
8. Early Lecture Readiness Video