



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

DIGITAL DESIGN AND EMBEDDED SYSTEM								
III Semester: CSE / CSE (CS) / CSE(DS) / CSE (AI & ML) / IT								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
AECD04	Foundation	3	-	-	3	40	60	100
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 48			
Prerequisite: Nil								

I. COURSE OVERVIEW:

The course introduces the basic knowledge of digital circuits and embedded systems. It covers design of switching circuits as combinational and sequential to verify the relation between input and output. They will learn to design counters, adders, sequence detectors. This course provides a platform for advanced courses like Computer architecture, Microprocessors & Microcontrollers and VLSI design.

II. COURSES OBJECTIVES:

The students will try to learn

- I. The basic concept of number systems, Boolean algebra and simplification of the logic functions.
- II. The Implementation of conventional combinational and sequential circuits.
- III. Implementation of conventional combinational and sequential circuits including conversions of flip-flops.
- IV. Understand the basics of an embedded system, understand the typical components of an embedded system.
- V. To understand different communication interfaces.

III. COURSE OUTCOMES:

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

- CO 1 Outline binary arithmetic operations and optimize Boolean functions using Karnaugh and tabulation method.
- CO 2 Make use of basic logic gates to realize the combinational logic circuits used in conventional electronic circuits.
- CO 3 Implementation of conventional combinational and sequential circuits including conversions of flip-flops.
- CO 4 Understand the design process of an embedded system.
- CO 5 Understand typical embedded System & its components.
- CO 6 Understand embedded firmware design approaches.

IV. COURSE CONTENT:

MODULE - I: NUMBER SYSTEMS AND BOOLEAN ALGEBRA (09)

Number systems, Complements of Numbers, Binary codes, Code Conversion, hamming code, Addition, subtraction, multiplication and division of binary numbers, Digital Logic Gates, Universal Gates, Laws of Boolean algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 5 variables, Tabular Method

MODULE –II: COMBINATIONAL LOGIC CIRCUITS (09)

Half and Full Adders, Subtractors, Binary adders, Carry look ahead adder, Comparators, Multiplexers, Demultiplexers, Encoder, Decoder, Priority encoder, Parity generator/checker, Code converters, 8bit ALU.

MODULE –III: SEQUENTIAL LOGIC DESIGN (10)

Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Ripple and Synchronous counters, Shift registers.

Finite state machines, Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, Pseudo Random Binary Sequence generator, Clock generation

MODULE –IV: INTRODUCTION TO EMBEDDED SYSTEMS (10)

History of embedded systems, Classification of embedded systems based on generation and complexity, Purpose of embedded systems, The embedded system design process-requirements, specification, architecture design, designing hardware and software, components, system integration, Applications of embedded systems, and characteristics of embedded systems.

MODULE –V: TYPICAL EMBEDDED SYSTEM (10)

Core of the embedded system-general purpose and domain specific processors, ASICs, PLDs, COTs; Memory-ROM, RAM, memory according to the type of interface, memory shadowing, memory selection for embedded systems, Sensors, actuators, I/O components: seven segment LED, relay, piezo buzzer, push button switch, other sub-systems: reset circuit, brownout protection circuit, oscillator circuit real time clock, watch dog timer.

V. TEXT BOOKS:

1. R.P. Jain, “Modern digital Electronics”, Tata McGraw Hill, 4th edition, 2009.
2. Shibu K V, “Introduction to Embedded Systems”, McGraw Hill Education.
3. Wayne Wolf, “Computers as Components”, Morgan Kaufmann, 2nd edition, 2010.

VI. REFERENCE BOOKS:

1. Morris Mano, “Digital Design”, 4th edition, 2006.
2. W.H. Guthman, “Digital Electronics- An Introduction to Theory and Practice”, 2nd edition, 2006.
3. Lyla B Das, Embedded Systems - An Integrated Approach”, Pearson education, 2012.
4. frank Vahid, tony Gravari’s, “Embedded System Design”, john Wiley, 2nd edition, 2006.

VII. ELECTRONICS RESOURCES:

1. <http://nptel.ac.in/courses/117106086/1>
2. <http://books.askvenkat.com>
3. mcsbzu.blogspot.com
4. NPTE: nptel.ac.in/noc
5. NPTEL: digital design and embedded system

VIII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Definition and terminology
4. Tech-talk topics
5. Assignments
6. Model question paper - I
7. Model question paper - II
8. Lecture notes
9. Early learning readiness videos (ELRV)
10. Power point presentations