COURSE CONTENT

EMBEDDED SYSTEMS DESIGN								
I Semester: ES								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
BESD03	**ELECTIVE**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	-	-	3	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 48**		
Prerequisite:								

I. COURSE OVERVIEW:

This course aims to provide students with a solid foundation in embedded system design, covering both theoretical concepts and practical implementation. Students will learn about the design, development, and testing of embedded systems, as well as the key components involved in creating
efficient and reliable embedded solutions.

II. COURSES OBJECTIVES:

The students will try to learn

I. The difference between embedded systems and general purpose systems.
II. Develop an understanding of hardware/software co-design and its significance.
III. Implement basic networking and communication capabilities in embedded systems

III. COURSE OUTCOMES:

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

CO 1	Describe the characteristics, challenges, and constraints of embedded systems
CO 2	Apply the suitable memory technology and other components for different applications to meet the ever-growing needs of the embedded applications.
CO 3	Choose the fundamental components that make up an embedded board to implement an Instruction Set Architecture ‘s features in a processor
CO 4	Categorize the embedded firmware design approaches and development languages used for programming embedded devices.
CO 5	Make use of the memory hierarchy to minimize the access time in embedded architecture design.
CO 6	Identify the hardware software co- design issues pertaining to design of an embedded system using low power microcontrollers.

IV. COURSE CONTENT:

MODULE - I: NTRODUCTION TO EMBEDDED SYSTEMS (09)

Overview of microcontrollers and microprocessors Architecture, memory organization, and I/O operations, Selection criteria for choosing microcontrollers, Definition and characteristics of embedded systems, Embedded system applications and real-world examples, Challenges and constraints in embedded system design.

MODULE –II: TYPICAL EMBEDDED SYSTEM (09)

Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication
Interfaces.

MODULE –III: EMBEDDED SYSTEM SOFTWARE (09)
Embedded software development process, Embedded programming languages (C, Assembly), Real-time operating systems (RTOS) and scheduling.

Hardware/Software Co-design: Hardware-software partitioning, Communication between hardware and software components, Trade-offs and optimization techniques.

MODULE –IV: RTOS BASED EMBEDDED SYSTEM DESIGN (09)
Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

MODULE –V: EMBEDDED NETWORKING AND COMMUNICATION (09)
Network protocols (TCP/IP, MQTT, etc.), Wireless communication (Wi-Fi, Bluetooth, etc.), IoT (Internet of Things) concepts

V. TEXT BOOKS:

1. Frank Vahid, Tony Givargis, "Embedded System Design", John Wiley Publications, 3rd Edition, 2006.

VI. REFERENCE BOOKS:

1. Raj Kamal, "Embedded Systems", TMH, 2nd Edition, 2008.
2. Shibu K.V, "Introduction to Embedded Systems, McGraw Hill, 3rd Edition, 2012.
3. Lyla, "Embedded Systems", Pearson Education, 2nd Edition, 2013.