Semester: I/II			
Course Title	Introduction to Embedded Systems	**CIE Marks**	50
Course Code	BECETC105/205G	**SEE Marks**	50
Course Type	Theory	**Total Marks**	100
Course Category	ETC	**SEE Duration**	03 hrs
Hours Per Week	3L : 0T : 0P	**SEE Type**	Written
Total Hours	40 hrs	**Credits**	03

Course Learning Objectives
This course will enable the students to
• Understand about basic concepts of Embedded systems and its building blocks.
• Understand the hardware and software requirements for Embedded systems.
• Gain the knowledge about Embedded system design for various applications in day-to-day life.
Pre-Requisites
• Number System

Module-1	**(8 hrs)**
Introduction: Embedded Systems and General-purpose computer systems, History, Classifications, Applications and Purpose of Embedded Systems (**Text Book 1:** 1.1 to 1.6) **Core of Embedded Systems:** Microprocessors and Microcontrollers, RISC and CISC controllers, Big Endian and Little Endian Processors, Application Specific ICs, Programmable Logic Devices, COTS, Sensors and Actuators, Communication Interface, Embedded Firmware, other system components, PCB and passive components. (**Text Book 1:** 2.1.1.1, 2.1.1.3, 2.1.1.4, 2.1.1.6, 2.1.1.8, 2.1.2 to 2.1.4, 2.3.1, 2.3.2, 2.4 to 2.7)	
Module-2	**(8 hrs)**
Characteristics and Quality Attributes of Embedded Systems: Characteristics, Operational and Non-operational quality attributes (**Text Book 1:** 3.1 to 3.2) **Application Specific Embedded System -** Washing machine, Domain specific – Automotive (**Text Book 1:** 4.1, 4.2.1, 4.2.2)	
Module-3	**(8 hrs)**
Hardware Software Co-Design and Program Modelling: Fundamental issues in Hardware Software Co-design, Computational models in Embedded System Design (**Text Book 1:** 7.1, 7.2) **Embedded Hardware Design and Development:** Analog Electronic Components, Digital Electronic Components, VLSI & Integrated Circuit Design, Electronic Design Automation Tools (**Text Book 1:** 8.1 to 8.4)	
Module-4	**(8 hrs)**
Embedded Firmware Design and Development: Embedded Firmware Design Approaches, Embedded Firmware Development Languages (**Text Book 1:** 9.1, 9.2) **Embedded System Development Environments:** Types of files generated on cross compilation (only explanation – programming codes need not be dealt), Disassembler/ Decompiler, Simulators, Emulators and Debugging (**Text Book 1:** 13.2, 13.3, 13.4)	

Module-5	(8 hrs)
Real-Time Operating System (RTOS) based Embedded System Design: Operating System basics, Types of Operating Systems, Tasks, Process and Threads (only explanation – programming codes need not be dealt), Multiprocessing and Multitasking (**Text Book 1:** 10.1 to 10.4)	

Text Book:	
1.	"Introduction to Embedded Systems", Shibu K V, 2nd Edition, McGraw Hill Education,2018.

Course Outcome Statements: After the successful completion of the course, the student will be able to	
CO1	Explain basic concepts of an Embedded system.
CO2	Explain Embedded system hardware and software requirements.
CO3	Apply the design concepts of Embedded systems for different application domains.
CO4	Analyze the embedded system design case studies.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-
CO3	2		-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	-	-	2	-	-	-	2	-	2
Avg.	**2**	**2**	-	-	-	**2**	-	-	-	**2**	-	**2**

3: High, 2: Medium, 1: Low

Suggested Activity Based Assessment (ABA) Methods

- Assignment / Presentation covering case studies in healthcare, home automation and smart city applications.