Course Title:	Introduction To Embedded Systems	Semester	I/II
Course Code:	**BETCK105J /205J**	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P:S)	3:0:0:0	Exam Hours	03
Total Hours of Pedagogy	40 hours	Credits	03

Course Learning objectives: To teach students

CLO1. Introductory topics of Embedded System design

CLO2. Characteristics & attributes of Embedded System

CLO3. Introduction of Embedded System Software and Hardware development

CLO4. Industry traits in Embedded system design

`Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
2. Show Video/animation films to explain the functioning of various analog and digital circuits.
3. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
4. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
5. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1 (8 Hrs) Basics of computer Architecture & Introduction to Embedded System

Self-study: **: Number conversion and ASCII equivalent , Generic structure of Computer**

Basics of computer architecture and the binary number system: Basics of computer architecture, computer languages, RISC and CISC architectures, number systems, number format conversions, computer arithmetic, units of memory capacity

Introduction to embedded systems: Application domain of embedded systems, desirable features and general characteristics of embedded systems, model of an embedded system, microprocessor Vs microcontroller, example of a simple embedded system, figure of merit for an embedded system, classification of MCUs: 4/8/16/32 bits, history of embedded systems, current trends

Application: A tour of the world of embedded, current trends in industry of embedded system

(RBT Levels: L1,L2)

Module-2 The Typical Embedded System (8 Hours)

Self Study: Basic building blocks of Embedded System, Different PLDs, Interface design

Core of Embedded Systems : General Purpose and Domain Specific Processors, Application specific ICs, sensors and actuators, embedded firmware, other system components, PCB and passive components

Characteristics and quality attributes of embedded systems: Characteristics, Operational and nonoperational quality attributes, application specific embedded system - washing machine, domain specific – automotive

Applications: Electronics Control Unit employed in automotive application

(RBT Level: L1,L2

Module-3(Embedded Software & Hardware Design) (8Hours)

Self Study: Basic understanding of Analog and Digital Electronics Components characteristics

Hardware Software Co design and Program Modelling : Fundamental issues in Hardware Software Co-design, Computational models in Embedded System Design

Embedded Hardware Design and Development: Analog Electronic Components, Digital Electronic Components, Electronic Design Automation Tools

Application: Application of combinational and sequential circuit in product design

(RBT Level: L1,L2,L3)

Module-4 (Embedded System Design and Development Environment)(8 Hours)

Self Study: Basic understanding programming language

Embedded Firmware Design and Development: Embedded Firmware Design Approaches, Embedded Firmware Development Languages

Embedded System Development Environments: Types of files generated on cross compilation (only explanation – programming codes need not be dealt), disassemble/ decompiler, Simulators, Emulators and Debugging

Application: Importance of Emulator and simulator in design Development

(RBT Level: L1,L2,L3

Module-5 Trends in Embedded Industry(8 Hours)

Self Study: Current technology focus in Embedded

Processor Trends in Embedded System, Embedded OS Trends, Development Language Trends, Open standards frameworks and alliances , Bottlenecks

Application: Skill set to work with embedded system

RBT Level : L1,L2

Course outcomes (Course Skill Set)

At the end of the course the student will be able to:

1. Understand the industry trends in embedded system
2. Explain characteristics of Embedded System design
3. Acquire knowledge about basic concepts of circuit emulators, debugging and RTOS
4. Analyse embedded system software and hardware requirements
5. Develop programming skills in embedded systems for various applications.

Course Assessment and Evaluation Details (both CIE and SEE)
Continuous Internal Evaluation: 50 marks

Theory Assessment Tool	**Marks**	**Reduced marks**
IAT-1	**25**	**25**
IAT-2	**25**	
Assessment -1(activity based)	**25**	**25**
Assessment-2(activity based)	**25**	
Semester End Examination (SEE) : 50 marks		
SEE	**Marks**	**Reduced Marks**
Course end examination (Answer any one question from each unit – Internal choice)	**100**	**50**

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- To design a simple Embedded System like simple remote
- To demonstrate simple microcontroller based experiments like LED interfacing, LCD interfacing, DAC etc

Suggested Learning Resources:

Text Books :

1. . Lyla B Das, Embedded systems: An Integrated Approach, 1st Ed., Pearson, 2013
2. Shibu K V, "Introduction to Embedded Systems", Second Edition, McGraw Hill Education

Reference Books:

1. Kanta Rao B, Embedded Systems, 1st Ed., PHI
2. Frank Vahid & Tony Givargis, Embedded System Design, 2nd Edition, John Wiley,

Web links and Video Lectures (e-Resources):

NPTL Lectures: https://nptel.ac.in/courses/108102045 Embedded Systems, IIT Delhi, Prof. Santanu Chaudhary

COs and POs Mapping

COs	**POs**												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	1	2
CO1	**3**	**2**											3	
CO2	**3**	**2**	**2**	**3**									3	
CO3	**3**	**2**	**2**	**3**	**3**	**2**							3	
CO4	**3**	**2**	**2**		**3**	**2**							3	
CO5	**3**					**2**							3	

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped