B.E ELECTRONICS AND COMMUNICATION ENGINEERING
Choice Based Credit System (CBCS)
SEMESTER - VI

Embedded Controllers and Applications (3:0:0) 3
(Effective from the academic year 2021-22)

Course Code	**21EC654**	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Lecture Hours	40	Exam Hours	03

Course Objectives:

This course will enable students to:

Understand, differentiate, classify, and identify different purposes of embedded systems in which they evolved.

Analyze the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.

Discuss the hardware /software co-design approaches.

Demonstrate the applications of embedded controller systems as related to the industry trends.

Module – 1

Introduction: Introduction to embedded systems, significance and scope of embedded system in current scenario, industry applications, research and innovations related to embedded system, impact of course on societal problems.

Introduction to embedded controllers:

Introduction to embedded controller systems starting from definition of embedded system, embedded system vs general computing systems, history, classification, major application areas, and wearable devices-the innovative bonding of lifestyle with embedded technologies.

(8 Hours)

Module – 2

Typical embedded system:

Elements of embedded system, Analog and digital electronic components-Logic gates, Mux,De-Mux, Encoder, Decoder, Buffer ,Latch. Core of the embedded system, Sensors, Actuators, I/O Subsystem-Led,7-segment LED display, Optocoupler, Stepper motor, Relay, Piezo Buzzer, Push Button Switch, Keyboard. Communication Interfaces (I2C, SPI, IrDA, Bluetooth, Wi-Fi, Zigbee only), embedded firmware.

(8 Hours)

Module – 3

Embedded Systems-Application- and Domain Specific:

Application specific (Washing machine), Automotive domain examples, factors to be considered in selecting a controller.

Hardware Software Co-Design and Program Modelling: Fundamental issues in hardware software co-design, computational models in embedded design (excluding UML), hardware software trade-offs. **(8 Hours)**

Module – 4

Embedded Product Development Life cycle (EDLC):

What and Why is EDLC, Objectives, Different Phases, EDLC approaches (Modelling the EDLC)

(8 Hours)

	Module – 5

Industry Trends:
Processor trends in embedded system, Embedded OS trends, Development language trends-beyond embedded C, Open standards, Frameworks and Alliances, Bottlenecks, Development Platform Trends, Cloud, Internet of Things (IoT) and Embedded Systems-The Next Big Thing
Summary of the Course: Course covers the basic concepts on embedded controller systems, applications and the trends in the embedded industry.

(8 Hours)

Course outcomes: The students will be able to:

CO1: Understand the basic concepts of embedded controller systems.

CO2: Apply the knowledge of embedded controller systems and be able to differentiate, classify and identify various embedded systems.

CO3: Analyse the role of sensors, actuators, and their interfacing with I/O subsystems of embedded system.

CO4: Discuss the different computational models used in embedded system design.

CO5: Interpret the given case study material related to the product development of embedded controller systems in various domains

CO6: Perform an activity as related to industrial applications of embedded controller systems.

**Textbooks*:*
1.   K V Shibu, "Introduction to Embedded Systems" 2ᴺᴰ Edition , McGraw Hill, 2016.

References:
1. Yifeng Zhu," Embedded Systems with Arm Cortex-M Microcontrollers in Assembly Language and C", 2ᴺᴰ Edition, Man Press LLC ,2015.
2. Rajkamal, "Embedded Systems" 2ᴺᴰ Edition, McGraw Hill Publications, 2010.

COs and POs Mapping

COs	PO's											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1												
CO2		3										
CO3			3									
CO4	2											
CO5				2								
CO6										2		2

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