Embedded Systems

Course Code	23EC4602C	Year	III	Semester	II
Course Category	PE-III	**Branch**	ECE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Computer Organization and Architecture
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes	
After successful completion of the course, the student will be able to	BL
CO1 Describe the basics of embedded systems, their classification, memory types, communication interfaces, embedded firmware, and system components.	L2
CO2 Distinguish between various communication devices and peripheral devices used in embedded systems.	L3
CO3 Differentiate standard C from Embedded C, and compilers from cross-compilers, by analysing their structure, functionality, and relevance in embedded system programming.	L4
CO4 Differentiate among various tools and techniques used in embedded system development.	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of Correlations (3:High, 2:Medium, 1:Low)												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3								1			3	
CO2	2	2							1			3	
CO3	3	3			2				1			3	
CO4	3	3			2				1		1	3	
Avg.	3	3			2				1		1	3	

Syllabus		
Unit No.	Contents	Mapped CO
1	Introduction: Embedded System-Definition, History, Classification, Application areas and Purpose of Embedded Systems, The typical embedded System-Core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Characteristics, Quality attributes of an Embedded systems, Application-specific and Domain-Specific examples of an Embedded System, Main processing elements of Embedded System	CO1, CO2
2	Embedded Hardware Design: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watch dog timer, Real time clock.	CO1, CO2

3	Embedded Firmware Design: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.	CO1, CO2, CO3
4	Hardware Software Co-Design: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hard ware and Firm ware, ICE.	CO1, CO2
5	Embedded System Development: The integrated development environment, Types of files generated on cross-compilation, Dissembler/De-compiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools.	CO1, CO2, CO3, CO4

Learning Resources
Text Books
1. Raj Kamal, Embedded Systems: Architecture, Programming and Design, 4th Ed., McGraw-Hill Education, 2020.
2. Tammy Noergaard, Embedded Systems Architecture, Elsevier Publications, 2nd Ed.. 2012
Reference Books
1. Labrosse, Embedded Systems Building Blocks, CMP publishers. 2nd Ed., 2020
e-Resources & other Digital Material
1. https://nptel.ac.in/courses/108102045