

Course Code	Course Title	L	T	P	C
1153EC103	EMBEDDED SYSTEM DESIGN	3	0	0	3

a) Course Category

Allied Elective

b) Preamble

The objective is to impart the concepts and architecture of Embedded systems and to make the students capable of designing embedded systems. The course examines contemporary issues and problems in the design, development, and test of contemporary real-time embedded systems while emphasizing solid design practices to ensure safety and reliability.

c) Prerequisite

Microprocessor & Microcontroller.

d) Related Courses

Nil

e) Course Outcomes

On successful completion of this course the student will be able to

CO Nos.	Course Outcomes	Knowledge Level (Based on Revised Bloom's Taxonomy)
CO1	Explain the functional blocks of an embedded system and its software development processes	K2
CO2	Explain the theoretical background and practical experience in the design and development of sophisticated embedded system	K2
CO3	Familiarize the importance of safety and reliability in Contemporary Embedded system design	K2
CO4	Describe the Embedded system design techniques for performance optimization	K2
CO5	Enumerate the knowledge of Embedded system in the areas of Distributed Embedded System	K2

f) Correlation of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	M	L	-	-	H	-	-	-	-	-	-	-	-	-
CO2	L	M	H	-	-	-	-	-	M	-	-	-	L	L
CO3	-	M	H	-	-	-	M	-	-	-	-	-	L	-
CO4	L	M	H	-	-	-	-	-	-	-	-	-	L	L
CO5	-	-	M	-	H	-	-	-	M	-	-	-	L	L

g) Course Content

UNIT I FUNDAMENTALS OF EMBEDDED SYSTEM 9

Introduction - Introduction of embedded system – Processor-Memory-Peripherals- Software Algorithms-Microcontroller-Microprocessor based – board based. Compilation Process in Embedded System: Compiling code-preprocessor- compilation-linking and loading-Symbols, references and relocation-linker/loader. Debugging Techniques: High Level language simulation – low level simulation – onboard debugger – task level debugging – symbolic debug-Emulation.

UNIT II HARDWARE SOFTWARE CO-DESIGN 9

Introduction and Motivation, Co-design Process Overview, Development Lifecycles - Specification, Modeling Tools and Languages, Techniques of Hardware Software Co - design -Partitioning, Co-Simulation, Co-Synthesis, Co-Verification.

UNIT III SAFETY AND RELIABILITY 9

Techniques, Proactive Approach - Software Solutions – Approaches, Hardware Solutions– Approaches, Steps to a Safe Design, Extreme Reliability - Long Life Applications, Critical Components, Dealing with Failure, Specification.

UNIT IV OPTIMIZATION AND PERFORMANCE ANALYSIS 9

Introduction, Basic Measures, Real time Considerations – Hard, Soft, Firm , Time Loading – Simulation, Instrumentation, Response Time, Memory Loading, Performance Evaluation, Performance Optimization, Hardware Accelerators, Hardware Platforms - Microprocessors and FPGAs, Optimizing Power Consumption, Trade-offs.

UNIT V DISTRIBUTED SYSTEMS 9

Introduction, Local and Remote Models, Intra and Inter System Communication, Protocols, Error Management – Failure Detection, Reconfiguration, Recovery idempotent Systems , Pipes, Streams, and Sockets, Remote Services and Procedures, Design Issues, Synchronous and Asynchronous Procedures

Total 45 Hrs

h) Learning Resources

Text Books

1. Steve Heath "Embedded Systems Design" Second Edition, Elsevier.
2. Frank Vahid & Tony Givargis "Embedded System Design-A Unified Hardware/Software Introduction" Third Edition, John Wiley & Sons Inc. Reprint 2010.
3. Michael Barr & Anthony Massa "Programming Embedded Systems-with C & GNU Development tools" Second Edition, O'REILLY, Reprint-2007.
4. Arnold S. Berger "Embedded Systems Design", CMP Books

Reference Books

1. David E. Simon "An Embedded Software primer" Pearson Publication.

Online Resources

1. <https://www.youtube.com/watch?v=4CPIjYGIYqc>
2. <https://www.youtube.com/watch?v=y70V0qHAFNQ>
3. <https://www.youtube.com/watch?v=yAOfqK1kQso>