

Course Code	Course Title	L	T	P	C
1152EC113	EMBEDDED SYSTEM DESIGN	3	0	0	3

a) Course Category

Program Elective

b) Preamble

The course gives introduction to embedded system components, design, safety, reliability and optimization performance analysis of an embedded product and gives the brief view on distributed embedded system

c) Prerequisite

Microprocessor & Microcontroller.

d) Related Courses

Real Time Operating System, Embedded Control System

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	Review the functional blocks of an embedded system and its software development process.	K2
CO2	Generalize the design and development of sophisticated embedded systems.	K2
CO3	Associate the importance of safety and reliability in contemporary embedded system.	K2
CO4	Explain various techniques for performance optimization.	K2
CO5	Describe the growing area of distributed embedded systems.	K2

f) Correlation of COs with POs

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

g) Course Content

UNIT I FUNDAMENTALS OF EMBEDDED SYSTEM 9

Introduction to embedded system: Processor – Memory – Peripherals – Software – Algorithms – Microcontroller - Microprocessor based – board based.
 Compilation Process in Embedded System: Compiling code – preprocessor compilation - linking & 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

Co-design Process: Overview - Development Life cycles - Specification, Modeling Tools and Languages, Techniques of Hardware Software Codesign: Partitioning - Co-Simulation, Co-Synthesis - Co-Verification

UNIT III SAFETY AND RELIABILITY 9

Safety and Reliability 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 to Distributed Systems, 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. James K.Precol, "Embedded Systems-A Contemporary Design Tool", John Wiley & Sons, Inc-2008.
3. Frank Vahid& Tony Givargis, "Embedded System Design-A Unified Hardware/Software Introduction", Third Edition, John Wiley & Sons Inc., Reprint 2010.
4. Michael Barr & Anthony Massa, "Programming Embedded Systems-with C & GNU Development tools", Second Edition, O'REILLY, Reprint-2007
5. 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>