NIRMA UNIVERSITY
Institute of Technology
B.Tech. in Computer Science and Engineering
Semester VI
Department Elective-I

L	T	P	C
2	0	2	3

Course Code	2CSDE57
Course Title	Embedded Systems

Course Outcomes:

At the end of the course, students will be able to -

1. comprehend the general structure of embedded systems, their design requirements and applications
2. analyze and evaluate real-time scheduling strategies as per the application specific needs
3. apply suitable communication protocols for designing embedded systems.

Syllabus

Teaching Hours: 30

Unit I **04**

Introduction: Embedded Systems overview, characteristics of embedded systems, applications, common design metrics, and design challenges, Processor technology, IC technology, Design Technology, Types of embedded systems, Hardware and software units of embedded systems, embedded system development tools, and examples of embedded systems.

Unit II **08**

Processors and Controllers: Custom single purpose processors, General purpose processors, Standard single purpose processor, ARM Processor Fundamentals and Architectures, ARM Instruction Set, ARM advanced Family processors

Unit III **06**

Real Time Operating Systems: OS services, RTOS in embedded systems, RTOS scheduling models, Task prioritization, Pre-emptive and cooperative inter task communication, Introduction to Open Source RTOS.

Unit IV **06**

System on Chip and Communication Basics: System architecture, Approach for SOC design, Chip design trade-off, Basic protocol concepts, Advanced communication principles, Serial and Parallel Protocols, Device Drivers for Interrupt-Handling, Memory Device Drivers.

Unit V **06**

Embedded Programming and Embedded Systems Design: Tools and Languages, Case Study of Smart STBs, multimedia streaming devices.

Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on the above syllabus with minimum 10 experiments to be incorporated.

Suggested Reading^:

1. Shibu K. V, Introduction to Embedded Systems, TMH.
2. Frank Vahid, Tony Givargis, Embedded system design: A unified Hardware/Software introduction,Wiley.
3. Steve Furber, ARM System-on-Chip Architecture, Addison-Wesley.
4. Andrew N. Sloss, Dominic Symes and Chris Wright, ARM System Developer's Guide, Designing and Optimizing System software, Elsevier.
5. Muhammad Ali Mazidi, PIC Microcontroller And Embedded Systems : Using Assembly And C, Pearson education India
6. Jane W. Liu, Real-Time Systems, Prentice Hall.
7. Steve Heath, Embedded Systems Design, Newnes.
8. Tammy Noergaard, Embedded Systems Architecture - A Comprehensive Guide for Engineers and Programmers, Elsevier.
9. Michael J. Flynn, Wayne Luk, Computer System Design: System on Chip, Wiley.
10. ChangyiGu, Building Embedded Systems: Programmable Hardware, APress.
11. Mohit Arora, Embedded System Design: Introduction to SoC System Architecture, Learning Bytes.

L=Lecture, T=Tutorial, P=Practical, C=Credit

^this is not an exhaustive list