NIRMA UNIVERSITY
SCHOOL OF TECHNOLOGY, INSTITUTE OF TECHNOLOGY
B.Tech. Electronics & Communication Engineering
Semester - VI
Department Elective III

L	T	P	C
3	-	2	4

Course Code	2ECDE60
Course Title	Embedded Systems

Course Outcomes (COs):

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

1. Propose the block diagram (architecture) of an embedded system for given specifications.
2. Comprehend modern controller architecture along with bus protocols.
3. Develop an application using real-time operating system and device driver.

Syllabus: **Teaching Hours:45**

UNIT I: Introduction   **10**

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, examples of embedded systems, embedded programming tools and languages.

UNIT II: Processors and Controllers   **12**

ARM Embedded Systems, ARM Processor Fundamentals and Architectures, ARM Instruction Set, ARM Thumb Instruction Set, Efficient C Programming for ARM, ARM advanced Family processors.

UNIT III: Real-Time Operating Systems   **12**

OS services, Network OS, RTOS in embedded systems, RTOS scheduling models, task enrolment and scheduling, task prioritization, context switching, multitasking, preemptive and cooperative inter-task communication, event management; locking mechanism, interrupt handling, Introduction to Open Source RTOS like uCOS, FreeRTOS, etc. and overview of Mobile OS.

UNIT IV: Device Drivers   **03**

Introduction, their functions, architecture, types, and implementations.

UNIT V: Bus Protocol and Networks for Embedded Systems   **06**

Universal Serial Bus (USB), Serial Peripheral Interface (SPI), Inter-integrated Circuit (I2C), Controller Area Network Bus (CAN Bus).

UNIT VI: Embedded System Design   **02**

Unified Modeling Language (UML), Case Study based on Recent Trends in Architecture and Applications.

Self-Study:

The self-study content will be declared at the commencement of the 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 of 10 experiments to be incorporated

Suggested Readings:

1. K. V. Shibu, Introduction to Embedded Systems, TMH.
2. Andrew N. Sloss, Dominic Symes and Chris Wright, ARM System Developer's Guide, Designing and Optimizing System Software, Elsevier.
3. Rajib Mall, Real-Time Systems: Theory and Practice, Pearson Education.
4. Janice Gillispie Mazidi, Muhammad Ali Mazidi, and Rolin D. McKinlay, The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Pearson Education.

5. Steve Furber, ARM System-on-Chip Architecture, Addison-Wesley

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