



C. U. SHAH UNIVERSITY – WADHWAN CITY

FACULTY OF TECHNOLOGY AND ENGINEERING DEPARTMENT OF COMPUTER ENGINEERING M. TECH. SEMESTER: - I

SUBJECT NAME: Embedded System and Design (ESD)

SUBJECT CODE: 5TE01ESD1

Teaching & Evaluation Scheme: -

Subject Code	Subject Name	Teaching Scheme (Hours)				Credit	Evaluation Scheme							
		Th	Tu	Pr	Total		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hours	Marks	Hours	Pr/Viva	TW	Pr	
5TE01ESD1	Embedded System and Design	4	0	2	6	5	30	1.5	70	3.0	-	20	30	150

Objectives:

- Introduce the students to the issues and challenges in developing embedded systems. Educate them in formal modeling, design and development methodologies.

Prerequisites:

- Knowledge of microprocessor, microcontroller, OS, Basic assembly language programming.

Course outline:

Sr. No.	Course Contents
1	Embedded Architecture: Embedded Computers, Characteristics of Embedded Computing Applications, Challenges in Embedded Computing system design, Embedded system design process- Requirements, Specification, Architectural Design, Designing Hardware and Software Components, System Integration, Formalism for System Design- Structural Description, Behavioral Description, Design Example: Model Train Controller
2	Embedded Processor And Computing Platform: ARM processor- processor and memory organization, Data operations, Flow of Control, SHARC processor- Memory organization, Data operations, Flow of Control, parallelism with instructions, CPU Bus configuration, ARM Bus, SHARC Bus, Memory devices, Input/output devices, Component interfacing, designing with microprocessor development and debugging, Design Example : Alarm Clock.

3	Networks: Distributed Embedded Architecture- Hardware and Software Architectures, Networks for embedded systems- I2C, CAN Bus, SHARC link ports, Ethernet, Myrinet, Internet, Network-Based design- Communication Analysis, system performance Analysis, Hardware platform design, Allocation and scheduling, Design Example: Elevator Controller.
4	Real-Time Characteristics: Clock driven Approach, weighted round robin Approach, Priority driven Approach, Dynamic Versus Static systems, effective release times and deadlines, Optimality of the Earliest deadline first (EDF) algorithm, challenges in validating timing constraints in priority driven systems, Off-line Versus On-line scheduling.
5	System Design Techniques: Design Methodologies, Requirement Analysis, Specification, System Analysis and Architecture Design, Quality Assurance, Design Example: Telephone PBX- System Architecture, Ink jet printer- Hardware Design and Software Design, Personal Digital Assistants, Set-top Boxes.

Learning Outcomes:

After finishing the course the student shall be able to:

1. Describe the special requirements that are imposed on embedded systems
2. Describe the key properties of microprocessor
3. Sketch a design of an embedded system around a microprocessor
4. Explain how microprocessor, memory, peripheral components and buses interact in an embedded system and how architectural and implementation decisions influence performance and power dissipation
5. Basics of a real-time operating system

Books Recommended:

1. Computers as Components: Principles of Embedded Computing System Design, **Wayne Wolf**; Morgan Kaufman Publishers (2001)
2. Real-Time systems, **Jane.W.S. Liu**; Pearson Education Asia (2000)
3. Real-Time Systems, **C. M. Krishna and K. G. Shin**; McGraw-Hill (1997)