GUJARAT TECHNOLOGICAL UNIVERSITY
MASTER OF COMPUTER APPLICATIONS (MCA)
SEMESTER: V

Subject Name: **Software Development for Embedded system (SD-ES) (Elective-III)**
Subject Code: **650012**

Objectives: Students will be able to

- Study the common characteristics of embedded system and challenges to designers.
- Work with three key technologies- processor technology, IC technology, design technology
- Differentiate between general-purpose, application specific and single purpose processors.
- Use Laboratory tools for Embedded Software Development

Prerequisites: Gates and Electronic circuits, Boolean Algebra, Combinational and sequential circuits, C, C++

Content:

1. Introduction
Embedded Systems overview, Design challenges-Optimizing Design Metrics, Processor Technology, IC technology, Design Technology, Trade-offs.

2. Custom Single Purpose Processors :Hardware
Introduction, Combinational Logic, Sequential Logic, Custom Single Purpose Processor Design, RT-Level Custom Single Purpose Processor Design, Optimizing Custom Single Purpose Processors.

3. General Purpose Processors: Software
Introduction, Basic architecture, Operation, Programmer's View, Development Environment, Application specific Instruction set Processors(ASIPs), Selecting a microprocessor, General-Purpose Processor Design

4. Standard Single Purpose Processors-Peripherals
Introduction, Timers, Counters and Watchdog Timers, UART, Pulse width modulators, LCD controllers, Keypad controllers, Stepper Motor controllers, Analog-to-Digital Converters, Real-Time Clocks

5. Memory
Introduction, Memory Write Ability and Storage Permanence, Common Memory Types, Composing memory, Memory Hierarchy and Cache, Advanced RAM

6. Interfacing

Introduction, Communication Basics, Microprocessor Interfacing: I/O addressing, Microprocessor Interfacing : Interrupts, Microprocessor Interfacing: Direct Memory Access, Arbitration, Multilevel Bus architectures, Advanced Communication principles, Serial Protocols, Parallel Protocols, Wireless Protocols

7. Digital Camera Example

Introduction, Introduction to a simple Digital Camera, Requirements Specification, Design

8. Embedded Software Development Tools

Host and Target machines, Linker/Locators for Embedded software, Getting Embedded Software into the Target System

9. Debugging Techniques

Testing on your Host Machine, Instruction set Simulators, The assert Macro, Using Laboratory Tools

10. An Example System

What the Program Does, Environment in Which the program Operates, A guide to the Source Code, Source Code

Text Books:

1. Frank Vahid/Tony Givargis, "Embedded System Design – A Unified Hardware / Software Introduction" Wiley Student Edition, Chapters 1 to 7
2. David Simon, "An Embedded Software Primer" Pearson, Chapter 9,10,11

Reference Books:

1. Daniel Gajski, Frank Vahid, Sanjiv Narayan, & Jie Gong, "Specification and Design of Embedded Systems" Pearson
2. Raj Kamal, "Embedded Systems: Architecture, Programming and Design" McGraw-Hill
3. K V Shibu, "Introduction to Embedded Systems" McGraw-Hill
4. Iyer and Gupta, "Embedded Realtime System Programming", McGraw-Hill