

# GUJARAT TECHNOLOGICAL UNIVERSITY

## ELECTRICAL & ELECTRONICS ENGINEERING

### B. E. SEMESTER: VII

Subject Name: **Embedded Systems and Applications (Department Elective – I)**  
 Subject Code: **170805**

| Teaching Scheme |          |           |       | Evaluation Scheme   |           |                           |                      |
|-----------------|----------|-----------|-------|---------------------|-----------|---------------------------|----------------------|
| Theory          | Tutorial | Practical | Total | University Exam (E) |           | Mid Sem Exam (Theory) (M) | Practical (Internal) |
|                 |          |           |       | Theory              | Practical |                           |                      |
| 4               | 0        | 2         | 6     | 70                  | 30        | 30                        | 20                   |

| Sr. No | Course Content  | Total Hrs. |
|--------|---|------------|
| 1.     | <b>Introduction to Embedded Systems:</b><br><br>General Characteristics of Embedded Systems, Classification of Embedded Systems, Application Specific Characteristics, Essential Components, Overview of Processors and hardware units in an embedded system, Embedded Processor.   | 8          |
| 2.     | <b>Embedded System Hardware:</b><br><br>I/O Devices - Device I/O Types and Examples – Synchronous - ISO-synchronous and Asynchronous Communications from Serial Devices - Examples of Internal Serial-Communication Devices - UART and HDLC - Parallel Port Devices - Sophisticated interfacing features in Devices/Ports-Timer and Counting Devices - '12C', 'USB', 'CAN' and advanced I/O Serial high speed buses- ISA, PCI, PCI-X, cPCI and advanced buses.                                      | 8          |
| 3.     | <b>Embedded Computing Platform:</b><br><br>Software embedded into the system – Exemplary Embedded Systems – Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits, Programming in assembly language (ALP) vs. High Level Language - C Program Elements, Macros and functions -Use of Pointers - NULL Pointers - Use of Function Calls – Multiple function calls in a Cyclic Order in the Main Function Pointers – Function Queues and Interrupt Service Routines Queues Pointers – | 8          |
| 4.     | <b>Programming Embedded Systems:</b><br><br>Concepts of EMBEDDED PROGRAMMING in C++ - Objected Oriented Programming – Embedded Programming in C++, 'C' Program compilers – Cross compiler – Optimization of memory codes.   | 8          |

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|----|---|---|
| 5. | <b>Embedded System Development:</b><br><br>Hardware Software Partitioning, Hardware Synthesis, Software Synthesis and Code Generation, Simulation, Implementation, Introduction to RTOS, Basic design using RTOS, Real Time Constraints, Cost and Power Constraints, Power issues in embedded system. | 8 |
| 6. | <b>Applications of Embedded Systems:</b><br><br>Applications to: Communication, Process Control, Motor Speed Control, Multi Motor Control, Robotics.  | 5 |

### **Laboratory & Assignments:**

- Write relevant programs for skill development of embedded system interfacing and development
- Case Study and Assignments for Designing a Complete System

### **Text Books:**

1. Raj Kamal, "Embedded Systems", Tata McGraw Hill, New Delhi.
2. David E. Simon, "An Embedded Software Primer ", Pearson Education

### **Reference Books:**

1. Frank Vahid, Tony Givargis, "Embedded System Design: A Unified Hardware/Software Introduction", John Wiley
2. Daniel Lewis, "Fundamentals of Embedded Software", Pearson Education.
3. Barnett, Cox, O'Cull, "Embedded C Programming and the Atmel AVR ", Thomson Learning
4. Craig Hollabaugh, "Embedded Linux", Pearson Education
5. Shibu, Introduction to Embedded Systems, McGrawHill.
6. Wolf, "Computers As Components", Elsevier
7. Heath, "Embedded System Design", Elsevier
8. Muhammad Ali Mazidi and Janice Gillispie Mazidi, "The 8051Microcontroller and Embedded Systems", Pearson Education