

Course Name : Computer Engineering Group
Course Code : CO/CD
Semester : Sixth for CO/CD
Subject Title : Embedded System (Elective-II)
Subject Code : 9211

Teaching and Examination Scheme:

| Teaching Scheme | | | Examination Scheme | | | | | | |
|-----------------|----|----|--------------------|----|----|----|-----|-----|-------|
| TH | TU | PR | PAPER HRS | TH | TE | PR | OR | TW | TOTAL |
| 02 | -- | 04 | 03 | 80 | 20 | -- | 25# | 25@ | 150 |

Rationale:

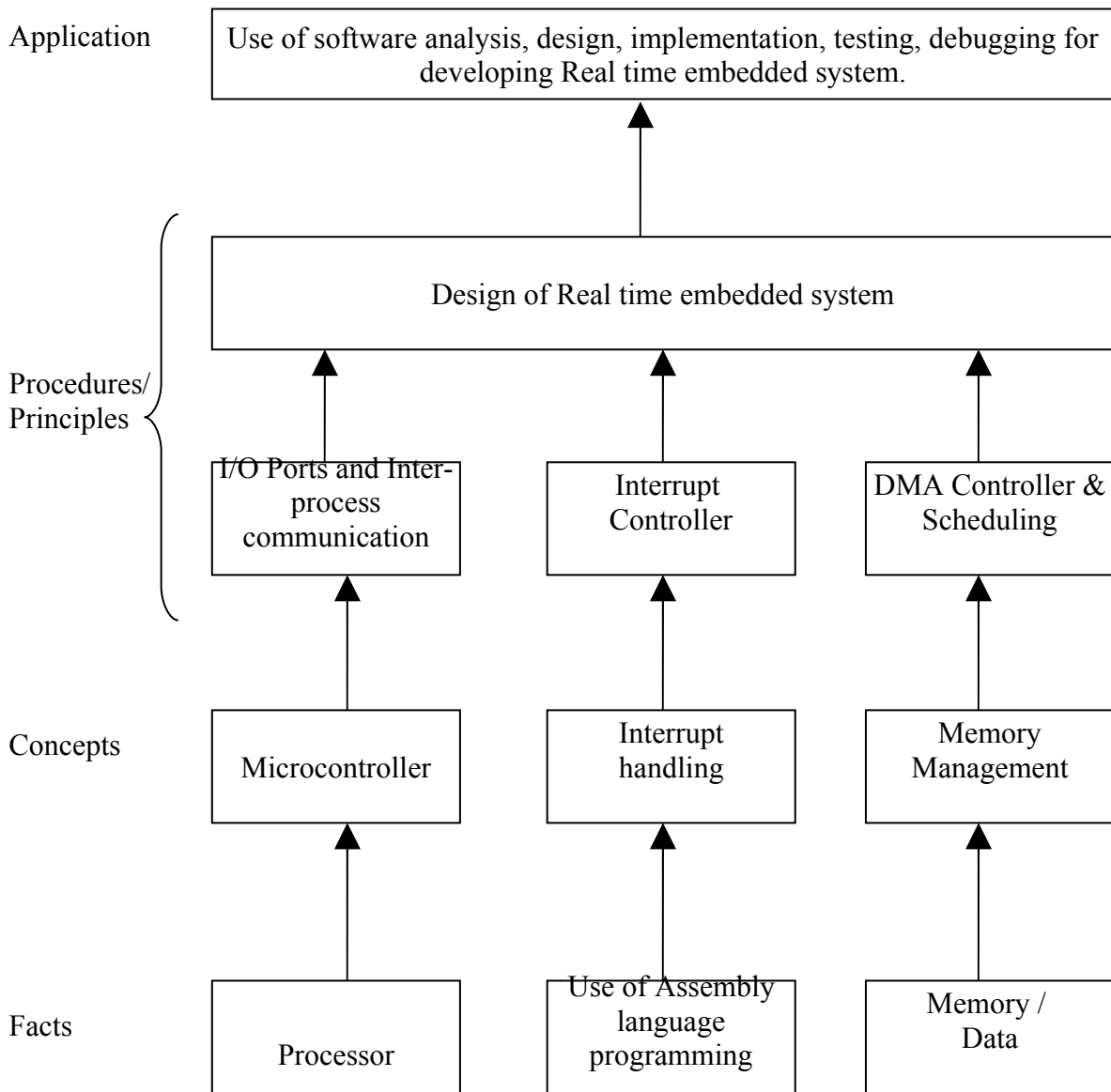
The study of embedded systems is essential part of Computer Science. It deals with computer hardware with software embedded in it. This subject will enable student to develop logical thinking and use of “Firmware”. It is practical oriented subject having theoretical prerequisites of Microprocessor, Digital Techniques, Data Structures and Computer Architecture. Students will be able to develop Real Time Systems, Device drivers, use interrupt service mechanism, program timing and counting devices and develop embedded C-Programs for Microcontroller.

Objectives:

The student will be able to:

1. Access embedded systems hardware units like processor, I/O device, On-chip and Off-chip device, Power supply etc.
2. Interface various devices using ports.
3. Write embedded program.
4. Develop programmable interrupt controller.
5. Perform software analysis, design, implementation, testing, debugging for embedded systems.

Learning Structure:



Contents: Theory

| Chapter | Name of the Topic | Hours | Marks |
|---------|--|-------|-------|
| 01 | 8051- Microcontrollers 1.1 Overview of 8051 family. 1.2 Architecture. 1.3 Memory organization. 1.4 Functional pin, Ports & circuit. 1.5 Addressing mode, Instruction Set. | 03 | 08 |
| 02 | Hardware overview 2.1 Study of interrupt structure. 2.2 Port structure. & Programming. 2.3 Study of SBUF, TCON, TMOD, SMOD, SCON Register. 2.4 Timer/Counter & Serial Communication Programming. | 04 | 12 |
| 03 | Serial Communication & Parallel communication 3.1 Serial Communication – RS-232, I2C, CAN 3.2 Parallel Communication – ISA, PCI, PCI-X 3.3 Advance I/P O/P buses. 3.4 Study of RS-232 Pinout. | 05 | 10 |
| 04 | Embedded System 4.1 Introduction. 4.2 Processor in the system. 4.3 Different Hardware Units. 4.4 Software Embedded into System. 4.5 Exemplary Embedded system. 4.6 System –On-Chip (SOC) & VLSI system. | 03 | 10 |
| 05 | Memory organization 5.1 Structure unit in processor 5.2 Processor selection 5.3 Memory devices & Selection 5.4 Allocation of memory 5.5 DMA 5.6 Interfacing processor & I/P O/P device | 04 | 08 |
| 06 | Device Driver & Interrupts Servicing Mechanism 6.1 Device Drivers 6.2 Parallel port device driver 6.3 Serial port device driver 6.4 Internal Programmable timing devices | 05 | 12 |

| | | | |
|-----------|--|----|----|
| | 6.5 Interrupts handling Mechanism | | |
| | 6.6 Context switching | | |
| 07 | RTOS & Interprocess Communication 7.1 Concepts of RTOS 7.2 Requirement, Need, Specification of RTOS in Embedded systems 7.3 Multitasking 7.4 Task synchronization & Mutual Exclusion 7.5 Starvation, Deadlock, Multiple process 7.6 Problem of sharing data by Multiple task and routines 7.7 Interprocess communication | 08 | 20 |
| | Total | 32 | 80 |

Practical:

Skills to be developed:

Intellectual skills:

Use of programming language constructs in program implementation.

- To be able to apply different logics to solve given problem.
- To be able to write program using different implementations for the same problem
- Study different types of errors as syntax semantic, fatal, linker & logical
- Debugging of programs
- Understanding different steps to develop program such as
 - Problem definition
 - Analysis
 - Design of logic
 - Coding
 - Testing
 - Maintenance (Modifications, error corrections, making changes etc.)

Motor skills:

- Proper handling of Computer System.

List of Practical

It is expected that students should perform at least 8 experiments from the following list. Out of which any one of the experiment shall be performed on 8051 kit & remaining can be performed using pc & kit either using Assembler or “C” programming language.

Student must also do a mini project covering practical knowledge gained in the subject & submit a brief project report with subject Journal. This report should also include the importance of the Project from industry point of view.

1. Write a Program on Block Move.
2. Assume 1 Hz. Frequency pulse is connected to I/P P3.4 Write a Program to display count on LCD kit.
3. Write a Program to find the frequency of square wave generated on pin P1.0.
4. Write a Program to generate a square wave of 50 Hz. Frequency on pin P1.2 using interrupt for timer.
5. Write a Program to connect INT 1 pin to a switch that is normally high whenever it goes low LED should turn ON which is connected to P1.3 & LED is normally OFF. LED should be ON as long as switch is pressed.
6. Write a Program to transfer message “Yes” serially at 9600 baud rate 8-bit, data, stop-bit & do this continuously.
7. Write a Program for Interfacing ADC & DAC.
8. Write a Program to Interface keyboard.
9. Write a Program to Interface LCD.
10. Write a Program to Interface stepper motor.

11. Mini project :

This project should be at least of level of interfacing some devices. “C” Programming language can also be used for development of project.

Learning Resources:**Books:**

| Sr. No. | Author | Title | Publisher |
|----------------|--------------------------------|--|-------------------|
| 1 | Raj Kamal | Embedded Systems | -- |
| 2 | David E. Simon | An Embedded Software Primer | Pearson Education |
| 3 | -- | The 8051 Microcontroller And Embedded Systems | Pearson Education |
| 4 | Frank Vahid, Toney Givargis | Embedded System Design: A unified Hardware/Software Introduction | John Wiley |
| 5 | Craig Hollabaugh | Embedded Linux | Pearson Education |
| 6 | Daniel Lewis | Fundamentals of Embedded Software | Pearson Education |
| 7 | Barnett, Cox, O’Cull | Embedded C Programming and the Atmel AVR | Thomson Learning |
| 8 | Mike Predko | Programming and Customizing the 8051 Microcontroller | Tata Magrow Hill |