

Course Name : Diploma in Computer Engineering

Course Code : CO/CD

Semester : Sixth

Subject Title : Embedded System (Elective)

Subject Code : 17626

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	--	--	25@	125

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).**

Rationale:

Now a day, we are surrounded with most of the embedded systems such as microwave oven, washing machine, DVD Player, Mobile Phone, I-Pod so on. In the earlier days, the embedded systems were designed using microprocessors like 8085, Z80 etc. Since the early eighties, small scale embedded has used microcontrollers such as Intel 8031, 8051, 8052 or Motorola 68HC05.

The advent in last few years of technology that embeds low level and high level processing hardware elements and Application Specific Processor in to single chip has given the added dimension to the embedded system that are multiprocessor system on a single VLSI chip called as System On Chip (SOC) and are smart as well as highly sophisticated.

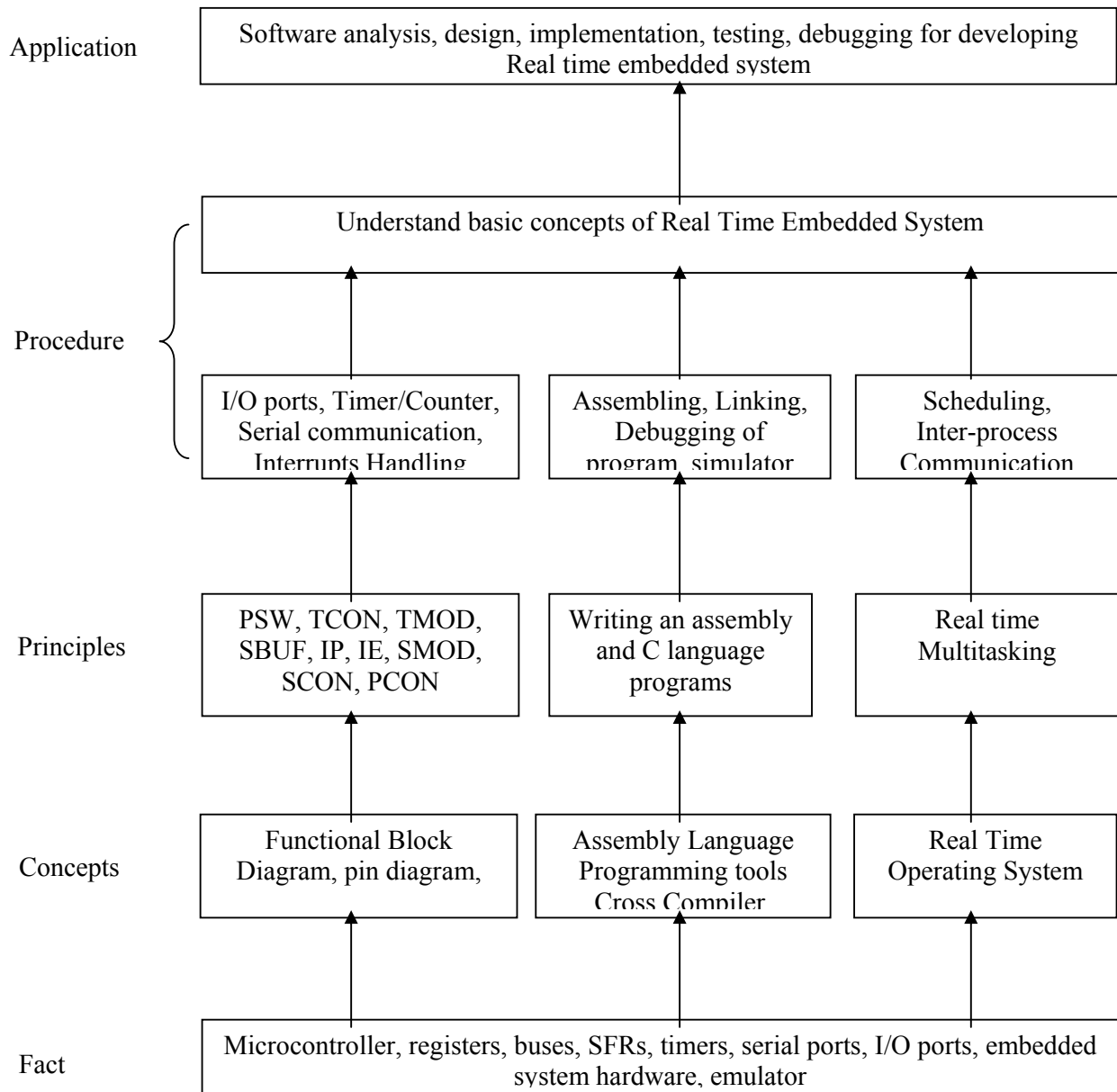
Embedded System deals with computer hardware with software embedded in it. This subject will introduce the 8051 microcontroller architecture, hardware overview of 8051, memory organization, instruction set, interrupts, timers, I/O ports, Serial communication protocols and embedded system with Real Time Operating System (RTOS).

General objectives:

The students will be able to

1. Know the hardware overview of 8051.
2. Write embedded program in C or Assembly language.
3. Understand the function of embedded system hardware such as processor, I/O devices, Watchdog timer, Oscillator, Reset circuitry, Power supply.
4. Know memory organization in 8051.
5. Interface various devices using serial and parallel ports.
6. Understand the concept of Real Time Operating System.

Learning Structure:



Contents: Theory

Name of Topics	Hours	Marks
<p>Topic 1: 8051 - Microcontroller Objective: Students will be able to</p> <ul style="list-style-type: none"> ➤ Draw the architecture of 8051 ➤ Identify the functions of different pins of 8051 ➤ Identify status of different flags <p>1.1 Introduction to 8051 family Microcontroller 1.2 8051 Microcontroller</p> <ul style="list-style-type: none"> • Salient features • Pins description, • Architecture of 8051 • Special function Register (SFR) • Memory Organization • I/O Ports, Timer/counters, Interrupt structure • Serial Port Interface • Boolean Operation • Power Down Operation 	08	16
<p>Topic 2: Instruction Set of 8051 Objective: Students will be able to</p> <ul style="list-style-type: none"> ➤ Use the different types of instructions ➤ Interpret addressing modes of instructions ➤ Write syntax of the instructions <p>2.1 Instruction Set of 8051</p> <ul style="list-style-type: none"> • Programmers model of 8051 • Operand types • Assembler Directives • Addressing modes • Data transfer, Arithmetic, logical, Control transfer instructions • Simple programs such as addition, subtraction, multiplication, division in assembly and 'C' • Execution of program using cross compiler like Keil IDE, SPJ, RIDE 	08	16
<p>Topic 3: I/O Ports, Timers/Counters, Interrupts and Serial Communication programming Objective: Students will be able to</p> <ul style="list-style-type: none"> ➤ Configure the different ports as input or output ➤ Use of timer/ counter in different modes ➤ Understand interrupts handling <p>3.1 Port Structure and Simple I/O port programming 3.2 Timer/Counter Programming in assembly and C 3.3 Serial Port programming in assembly and C 3.4 Interrupt programming in assembly and C</p>	10	16
<p>Topic 4: 8051 Interfacing Application Objective: Students will be able to</p> <ul style="list-style-type: none"> ➤ Understand the interfacing of display ➤ Learn the function of ADC and DAC ➤ Know the application of Stepper motor <p>4.1 Interfacing of seven segment display & LCD display Interfacing diagram & pin out of 2x16 LCD 4.2 Interfacing of 4x4 Keyboard, ADC & DAC- interfacing diagram &</p>	08	16

programming. 4.3 Interfacing of stepper motor- interfacing diagram & Programming function		
Topic 5: Embedded Systems Objective: Students will be able to <ul style="list-style-type: none"> ➤ Know the embedded system ➤ Learn different software and hardware development tools ➤ Understand embedded software development cycle 5.1 Introduction to Embedded System, Processor in system, different Hardware Units, advantages, Applications, Software embedded into system, System-On-Chip, Concept of Device Driver 5.2 Software & Hardware development tools , IDE, Compiler, Debugger, Simulator, Emulator, In circuit Emulator(ICE), Target Board, Device Programmer 5.3 Embedded software development cycle	08	18
Topic 6: RTOS & Inter-process Communication Objective: Students will be able to <ul style="list-style-type: none"> ➤ Understand the concepts of RTOS ➤ Know the concept multitasking, task synchronization ➤ Understand the concepts of deadlock, starvation 6.1 Concepts of RTOS, Need of RTOS in Embedded systems 6.2 Multitasking 6.3 Task synchronization & Mutual Exclusion 6.4 Starvation, Deadlock, Multiple process 6.5 Basics of Inter-process Communication	06	18
Total	48	100

Practical:

Skills to be developed:

Intellectual skills:

1. Use of programming language constructs in program implementation.
2. To be able to apply different logics to solve given problem.
3. To be able to write program using different implementations for the same problem
4. Study different types of errors as syntax semantic, fatal, linker & logical
5. Debugging of programs
6. 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:

1. Proper handling of Computer System.

List of Practical

It is expected that students should perform following practical's using pc and any cross C complier such as Keil, SPJ, RIDE etc.

1. Write a Program to toggle bits of P1 continuously forever with some delay.

2. Write a Program to generate square wave of 1 kHz on pin P1.0.
3. Write a program that continuously gets 8 bit data from Port 0 and sends it to Port 1, while simultaneously creating square wave of 200 μ sec on pin P2.1. Use timer 0 to create square wave.
4. Write a program that will generate a square wave with a period of 20 ms on pin P3.0 using Timer 1 interrupt.
5. Write a program to turn ON the LED connected to Port P1.3 pin on the occurrence of INT1 and turn OFF the LED after a delay of 20 msec.
6. Write a program to transfer the message "MSBTE" serially at baud rate 4800, 8 bit data, 1 stop bit.
7. Write a Program for Interfacing ADC
8. Write a Program for interfacing DAC to generate Saw tooth, Square wave, triangular wave, staircase wave.
9. Write a Program to Interface 4x4 matrix keyboard.
10. Write a Program to display "WELCOME" on 2x16 LCD.
11. Write a Program to Interface stepper motor in clockwise and anti-clockwise direction

Learning Resources:**Books:**

Sr. No.	Name of Book	Author	Publication
1	The 8051 Microcontroller and Embedded System using Assembly and C (Second Edition)	Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay	Pearson Education
2	The 8051 Microcontroller and Embedded System using assembly and C	Kenneth J. Ayala Dhananjay V Gadre	Cengage Learning India Pvt. Ltd.
3	Introduction to Embedded Systems	Shibu K.V.	Tata McGraw Hill
4	Embedded Systems Architecture, Programming, Design	Raj Kamal	Tata McGraw Hill

Websites:

1. <http://www.embeddedindia.com/>
2. <http://www.esacademy.com/>
3. www.EmbeddedTechJournal.com