

**Sir Padampat Singhania University, Udaipur**

**Department of Electronics & Communication Engineering**

**COURSE PLAN ( SPRING 2009-2010 )**

Name of the Course Teacher : R.N. Mishra  
Subject : Microcontrollers & Real-Time Applications  
Branch: ECE Semester: VI Year: III  
Course Code: EC 305 L-T-P-C: 3-0-1-4 w.e.f. 29.12.2009

Sr. No.	Topic	Contact Hours (Lectures)
1.	Introduction to computing: Computer, microprocessor, microcomputer, microcontroller, hardware, software, cross assembler, cross compiler, memory organization, buses and working of a computer.	1
2.	Microcontroller, difference between microprocessor and microcontroller, evolution and development of microcontroller, application example of microcontroller, criteria for choosing a microcontroller, Family of the 8051 microcontroller.	1
3.	Architecture of the 8051 microcontroller, Oscillator and timing circuitry, register array, memory organization: Internal program memory and data memory, Input and Output ports and structure of I/O ports, serial data communication and interrupt process.	2
4.	External memory and its interfacing with the 8051 microcontroller- Program memory, data memory, program/data memory.	2
5.	Instructions execute cycle and Bus cycle timing: Program memory read sequence, data memory read sequence, data memory write sequence.	1
6.	Addressing modes and data manipulation of the 8051 microcontroller: Register addressing, Immediate addressing, Direct addressing, Base-Register- plus Index- Register- Indirect addressing.	2

7.	Instruction set of the 8051 microcontroller: Data transfer group- MOV, MOVC, MOVX, PUSH, POP, XCH and XCHD, arithmetic group-ADD, ADDC, SUB, SUBB, INC, DEC, MUL, DIV and DA, logical group-ANL, ORL, XRL, CLR, CPL, RL, RLC, RR, RRC and SWAP, control transfer group- ACALL, LCALL, RET, RETI, AJMP, LJMP, SJMP, JMP, JZ, JNZ, CJNE, DJNE and NOP, bit manipulation instruction- CLR, SETB, CPL, ANL, ORL, MOV, JC, JNC, JB, JNB and JBC, subroutine and timing subroutine.	5
8.	Assembler directives and assembly language programming.	1
9.	I/O port Programming: 8051 I/O Programming and I/O bit manipulation programming.	1
10.	Timer Programming: Timer and Counter, Programming the 8051 timers: mode of operation – Mode 0, Mode 1 and Mode 2., Programming timer in different modes, Generation of time delay and finding value to be loaded into the timer, generation of large time delay, assembler and negative values, Counter programming in different modes.	2
11.	Serial Port Programming: Basics of serial communication, serial communication protocols, synchronous versus asynchronous communication, half versus full-duplex transmission, process of data framing, data transfer rate and bps rate, RS 232 standard, use of the MAX 232 and MAX 233 chips, 8051 serial port programming in assembly- Programming the 8051 to transfer data serially and importance of TI flag, Programming the 8051 to receive the data serially and importance of RI flag, Doubling the baud rate, Interrupt based data transfer.	3

12.	Interrupts Programming: The 8051 interrupts, interrupts versus polling, interrupt service routine, steps for executing interrupt, enabling and disabling interrupt, programming timer interrupts, programming external hardware interrupts- level triggered interrupt and edge triggered interrupt, sampling level triggered and edge triggered interrupt, programming serial communication interrupt, interrupt priority in the 8051, programming interrupt priority, interrupt in side an interrupt.	3
13.	LCD interfacing: LCD operation and pin descriptions, sending commands and data to LCDs with a time delay, sending code or data to the LCD with checking busy flag.	2
14.	Keyboard Interfacing: Key press and key detection mechanisms, Program to scan keyboard: scanning and identifying the key, grounding rows and recording the columns	1
15.	RTC interfacing: Working and Pin description of the DS 12887 RTC chip, Architecture and function of the Ds12887 RTC registers, DS12887 RTC interfacing with the 8051, program to access the RTC registers, program to display time and date, interrupt and alarm features.	2
16.	ADC and DAC interfacing: Characteristics and Selection of ADC chip, ADC 0804 pin description and operation, Interfacing and programming of ADC 0804 with the 8051 microcontroller. Multi channel ADC-ADC 0808/0809 chip with 8-analog channel, programming and interfacing ADC 0809 with the 8051 microcontroller, Programming and interfacing of ADC 0848 with the 8051 microcontroller, Digital to Analog Converter: DAC 0808 and its interfacing with the 8051 microcontroller.	4

17.	Sensor Interfacing and Programming for real-time data acquisition: Temperature sensors- LM34 and LM35, signal conditioning and interfacing the LM35 to the 8051 for reading and displaying the temperature.	2
18.	Interfacing and Programming the 8255: Architecture and pin description of the 8255 PPI chip, programming modes of the 8255 chip, interfacing 8255 with the 8051 microcontroller, interfacing and programming stepper motor with the 8051 microcontroller through 8255 chip.	3
19.	Relays and Optoisolators: Operations of electromechanical relays, solid state relays and Optoisolator. Stepper motor interfacing, unipolar versus bipolar stepper motor interface, controlling stepper motor via optoisolator	2
20.	DC Motor interfacing: DC motors control using an L293 chip, DC motor control using optoisolator.	1
21.	Development tools: Introduction to hardware and development tools- logic analyzer, In-circuit emulator, de-bugger, assembler, compiler, cross-assembler and cross-compiler, integrated development environment (IDE).	2
Total		43

**Texts:**

1. The 8051 Microcontroller and embedded systems by Mazidi, Mazidi and McKenley, Pearson Education.
2. Using the MCS-51 Microcontroller by Han-Way-Huang, Oxford University Press.
3. An Embedded Software Primer by David E. Simon, Pearson Education

