ECE: Microprocessor and Interface

Programme: B.Tech. (ECE) Year: 3rd Semester: V
Course : ECE331 Credits : 3 Hours : 40

Course Context and Overview (100 words):

Microprocessor is a required course for undergraduate students in the Electronics Engineering program. The purpose of this course is to teach students the fundamentals of microprocessor and microcontroller systems. The student will be able to incorporate these concepts into their electronic designs for other courses where control can be achieved via a microprocessor/controller implementation. Although assembly language programming is a large component of the course, this course is hardware-oriented. Students will comprehend the basic requirements and layout of microcomputer and applying those concepts to achieve a dedicated "embedded" controller as a component of a larger system. Much of the experiments will be using a laboratory trainers based on the instructor choice of processor and I/O devices like stepper motor , traffic light controller etc.

Prerequisites Courses: Nil

Course outcomes (COs):

On completion of this course, the students will have the ability to:
CO1: Students should be able to solve basic binary math operations using the microprocessor.
CO2: Students should be able to demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor.
CO3: Students should be able to program using the capabilities of the stack, the program counter, and the status register and show how these are used to execute a machine code program.
CO4: Students should be able to apply knowledge of the microprocessor's internal registers and Operations by use of a PC based microprocessor simulator.
CO5: Students should be able to write assemble assembly language programs, assemble into machine a cross assembler utility and download and run their program on the training boards.
CO6: Students should be able to design electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices.

Course Topics:

Topics	Lecture Hours

UNIT - I **1. Topic** Introduction	2	
1.1 Microcomputer and microprocessor, 1.2 Evolution of microprocessors, types of buses.	1 1	2
UNIT - II **2. Topic** Architecture of a Microprocessor and Microcontroller	6	
2.1 Internal architecture of Microprocessor and Micro Controller and its functional blocks	1	
2.2 Types of registers and their functions, IC pin outs and signals	1	6
2.3 Address, data and control buses, addressing, Opcode Fetch and execution procedure	1	
2.4 8 bit and 16 bit Micro Processors and microcontrollers	3	
UNIT - III **3. Topic** Addressing Modes	3	
3.1 Register addressing mode, direct addressing mode	1	3
3.2 Indirect addressing mode, implicit addressing mode.	1	
3.3 Base, Base Index, Relative and Stack addressing modes	1	
UNIT - IV **4. Topic** Instruction Set and assembly Language programming	6	
4.1 Data Transfer Instructions , 4.2 Arithmetic and Logical Instructions	3	6
4.3 Branching Instructions 4.4 Stack Instructions	3	
UNIT-V **5. Topic** Timing diagrams and Interrupts	6	
5.1 Clock signals, instruction cycles, machine cycles	2	9
5.2 Timing states, instruction timing diagrams and state transition diagram	4	
5.3 Interrupts, Interrupt vector table,	1	
5.4 Branching Instructions and Stack Instructions	2	
UNIT - VI **6. Topic** Interfacing of Memory, Coprocessors and I/O devices	7	7
6.1 Importance of interfacing, type of memories	1	
6.2 SRAM architecture, Types of Incompatibility	2	
6.3 Memory mapped and Port mapped I/O, memory interfacing, I/O interfacing.	2	
6.4 Co-Processor Architecture, data types and instructions	2	
UNIT - VI	7	7

7. Topic Programmable Interfaces		
7.1 Programmable Peripheral Interface	1	
7.2 Programmable Interrupt Controller	2	
7.3 Programmable Interval Timer	2	
7.4 Keyboard and Display Interface and DMA	2	

Textbook references (IEEE format):

1. *Hennessy, J. L., and D. A. Patterson.* Computer Architecture: A Quantitative Approach*, 3rd ed. San Mateo, CA: Morgan Kaufman, 2002. ISBN: 1558605967.*
2. *Patterson, D. A., and J. L. Hennessy.* Computer Organization and Design: The Hardware/Software Interface*, 3rd ed. San Mateo, CA: Morgan Kaufman, 2004. ISBN: 1558606041.*
3. *Microprocessor Architecture, Programming and Application with the 8085, Ramesh Gaonkar, Penram publication Pvt. Ltd., 2011.*

Text Book:

1. Microprocessor Architecture, Programming and Application with the 8085, Ramesh Gaonkar, Penram publication Pvt. Ltd., 2011.

2. Microprocessors and Interfacing, Douglas V. Hall, Tata McGraw Hill Publication.

3. Fundamentals of Microprocessors and Microcomputers, B. Ram, Dhanpat Rai Publications, NewDelhi.

Evaluation Methods:

Item	Weightage
Quiz1	10
Quiz2	
Quiz3	
Quiz4	
Assignment, Attendance and Performance	10
Midterm	30
Final Examination	50

Prepared By:
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