CS 350-Computer Organization and Assembly Language Programming

Prerequisite:

- CS 106 (or) CS 201

Textbook:

- D. Patterson and J. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Second Edition, 1998, ISBN: 1-55860-428-6.
- J. Morris Chang, CS350: Computer Organization and Assembly Language Laboratory Manual, IIT CS department published.
- Y. Patt and S. Patel, Introduction to Computing Systems: From Bits and Gates to C and Beyond, 1999 , ISBN: 0072467509.

Course Goals - Students should be able to:

- Explain the basic organization of the classical Von Neumann machine and its major functional units.
- Summarize how instructions and data structure are represented at both the machine level and in the context of a symbolic assembler and explain different instruction formats.
- Explain the basic concepts of interrupts and I/O operations.
- Use mathematical expressions to describe the Digital logic and digital systems .
- Discuss the physical limitations of electronic circuits and Implementation of data paths.
- Discuss control points and the generation of control signals using hardwired or microprogrammed implementations.

Topic Hours - breakdown

	Topic	***Hours***	***Cumulative***
1	Computer organization, history and future of computer architecture	2	2
2	Number systems (decimal, hexadecimal, binary) and basic operations, Quiz	4	6
3	ASCII code and Byte ordering	1.5	7.5
4	Introduction to MIPS Architecture	1.5	9
5	MIPS instructions - ALU instructions : Add, Sub, Or, And Memory Structure	3	12
6	Load Store Architecture - Lw, Sw, Lb, Sb	3	15
7	Branching Instructions - Beq, Bne, J, Jr, Jal	3	18
8	Comparison – Slt, Stack Implementation	3	21
9	Compilation of C structures into MIPS instructions - If, If-Else, For loop, Switch-Case, Procedure Calls, Recursion	3	24
10	Instruction formats - Rtype, Itype, Jtype, Review for Mid Term	3	27
11	Mid – Term Exam	1.5	28.5
12	Calculation of Target addresses for Conditional and Unconditional Branches, Arrays vs. Pointers in memory accesses	1.5	30
13	CPU design , Logic gates - Not, And, Or, Nand, Nor, Xor	3	33
14	Adder design: 1-bit, 8-bit Ripple Carry, 4-bit Look Ahead Carry,ALU design:1-bit, 8-bit	3	36
15	Register File organization, Program Counter and Instruction Register design	1.5	37.5
16	Decoder design, Memory path - Instruction and Data	1.5	39
17	System Clock ,Conditional and Unconditional branch control	3	42
18	Multiplication and Division Algorithms & Hardware design, Review	3	45
19	Laboratory Work	15	60
	Total Cumulative Hours		60

Tabulated Course Plan

CS350	Topic	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Lab	Tot
Week																				hrs	hrs
1		2	1																	1	4
2			3																	1	4
3				1.5	1.5															1	4
4						3														1	4
5							3													1	4
6								3												1	4
7									3											1	4
8										3										1	4
9											3									1	4
10												1.5	1.5							1	4
11														3						1	4
12															3					1	4
13																1.5	1.5			1	4
14																		3		1	3
15																			3	1	4
Hours		2	4	1.5	1.5	3	3	3	3	3	3	1.5	1.5	3	3	1.5	1.5	3	3	15	60