Course Outline

Title	**Computer Organization & Assembly Language**
Code	CS-3201-3
Credit Hours	4 Cr. Hrs. No. of Lectures/Week 2 Duration 1.5 Hrs. No. of Labs/Week 1 Duration 3 Hrs.
Prerequisite	DLD , Introduction to Computer Programming
Follow Up	Operating System
Category	Computer Science
Aims and Objectives	The students will be capable to ➢ Acquire knowledge that is specific to Intel 80x 86 processor families, as well as knowledge that is universal. ➢ Learn the programming methodologies showing how to use Assembly Language for 1. Application Software's 2. System Programming 3. Terminate & Stay Resident ➢ Write programs based on the interaction between Assembly Language & Operating System. ➢ To know the internal working of the microcomputer, it's peripherals, interfacing and memory ➢ To be le to design a basic computer with hard wired control ➢ To know the architectural developments like instruction level parallelism and cache optimization techniques.
Text Book/s	➢ Assembly Language Programming and Organization of the IBM PC by Ytha Yu and Charles Marut ➢ Computer System Architecture by M. Morris Mano (Third Edition)
Reference Material	➢ "The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium Pro Processor, Pentium II, Pentium III, Pentium 4" by **Barry B. Brey,** (Sixth Edition) ➢ "Assembly Language for Intel Based Computers" by **Kip R. Irvine,** (Fourth Edition).
Instructional Aids/Resources	➢ Handouts

Assessment Criteria		**Sessional**	**25%**	**Mid**	**35%**	**Final**	**40%**	**Total**	**100%**	
		Quizzes and Tests	05	Required:		Required:				
		Assignment and Presentations	05	Paper	35	Paper	40			
		Term paper	01							

Week	**Lecture**	**Topic**
1	1	**Introduction** ➢ History & Evolution of Intel Microprocessor And Assembly Language ➢ Applications and Advantages of Assembly Language **Processor Architecture & Organization** ➢ Organization of Intel 8086 Processor ➢ Instruction Execution Cycle
	2	**Memory Architecture** ➢ Memory Representation & Hierarchy ➢ Busses (Point and Multipoint) ➢ Data, Address, Control Busses
2	3	**Intel 8086/80386 Registers** ➢ Registers and their categories ➢ Function of Registers
	4	**Memory Addressing** ➢ Real Mode Memory Structure ➢ Memory Segmentation (Segment/Offset Scheme**)**
3	5	**"MOV" Instruction** ➢ Different variants of MOV instruction ➢ Different Directives **Addressing Modes** ➢ Description and Examples of different addressing modes

	6	**Debugger** ➢ Debugging instruction ➢ Writing Program in debugger
4	7	**Mathematical Instructions** ➢ Mathematical instructions like ADD, SUB, MUL, DIV etc. ➢ Related Programming examples
	8	**Logical Instructions** ➢ Logical instructions like AND, OR, XOR, NOT, NEG, TEST etc. ➢ Related Programming examples
5	9	**Stack Instructions** ➢ Introduction to stack ➢ PUSH, POP, PUSHF, POPF, PUSHA, POPA, PUSHAD, POPAD instructions
	10	**Memory Models, Practice of Program Writing and Debugging** ➢ Memory Models and their comparisons ➢ Introduction to Microsoft Assembler ➢ Practice of Writing Programs for MASM.
6	11	**Control Transfer and Conditional Action Instructions** ➢ Unconditional and Conditional Jump instructions ➢ Conditional Action Instructions ➢ LOOP And LOOPD Instructions
	12	**Procedures** ➢ Writing and Working of a procedure ➢ CALL and RET instructions ➢ Parameter passing in procedure ➢ Related Programming examples
7	13	**Shift and Rotate Instructions** ➢ Shift & Rotate Instructions (SHL, SHR, SHLD, SHRD, SAR, ROL, ROR, RCL, RCR) ➢ Related Programming examples
	14	➢ Procedures to Input Binary, Decimal, Hexadecimal Numbers
8	15	➢ Procedures to output Binary, Decimal, Hexadecimal Numbers
	16	**Course Review**

9	17	**String instructions** ➢ MOVSB/W/D, LOADSB/W/D, STOSSB/W//D, SCASB/W/D, CMPSB/W/D ➢ Related Programming examples
	18	➢ XLAT instruction ➢ Related Programming examples
10	19	➢ Structure of PSP, reading the command tail ➢ Related Programming examples
	20	➢ Computer Registers, Stored Program Organization, Addressing Modes for the Basic Computer. ➢ Designing and implementing 16 Bit Common Bus for Basic Computer.
11	21	➢ Computer Instructions for Basic computer (Memory Reference, Register Reference and I/O instructions) ➢ Control Unit for Basic Computer its inputs and outputs, Decoding the type of instruction.
	22	➢ Execution of Register Reference Instructions with related examples. ➢ Execution of Memory Reference Instruction with related examples.
12	23	➢ Input, Output and Interrupt. Input- Output Configuration. Execution of I/O instruction. Flow chart for interrupt Cycle. Complete flow chart for the Basic Computer Operation.
	24	➢ Design of the basic computer, Design of Control Circuit for Address Register, Data Register, Accumulator Register, Memory, Common Bus ➢ Design of the control inputs of the bus ➢ Design of the control inputs of the Flags
13	25	➢ Design of ALU for the basic computer
	26	➢ Introduction to pipelining ,Hazards related to pipelining and their solution
14	27	➢ Main memory, Memory Address map, Memory interfacing to the CPU
	28	➢ Introduction to Associative Memory, Designing single cell of associative memory. Designing the match logic of Associative memory.
15	29	➢ Cache memory. ➢ Data, Instruction & Unified Caches. Principle of locality (temporal and spatial). Cache hits and miss, Hit time, Miss Rate and Miss Penalty of a Cache. ➢ Write Strategy

	30	➢ Direct Mapped Cache implementation. ➢ Set Associative Cache implementation. ➢ Fully Associative Cache implementation.
16	31	➢ Virtual Memory, Memory Management Hardware
	32	➢ Course Review