<CS->- <Computer Organization and Assembly Language>

Form number	COURSE OUTLINE / DOCUMENT	
COURSE INSTRUCTOR INFORMATION	Name	Muhammad Usama
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DEGREE INFORMATION	Program	Batch	Section(s)					Semester	FALL
	BSCS	21	A	B	C			Year	2022

COURSE INFORMATION	Course Category C- Core/ E-Elective		Code	Title	Credit hours
	C		CS-	COAL	3
	Prerequisite(s)		CS-	DLD	4
	TA Required (Yes/ No)	No. of TA(s)	Brief Justification		
	Yes	03			

TEXT BOOK(s) INFORMATION		
	Title of Book	Assembly Language for x86 Processors
	Author(s)	Kip R. Irvine
	Publisher	Pearson
	Title of Book	The Elements of Computing Systems
	Author(s)	Noam Nisan & Shimon Schocken
	Publisher	MIT Press
	Title of Book	Assembly Language Programming (Lecture Notes)
	Author(s)	Belal Hashmi, Junaid Haroon
	Title of Book	x86-64 Assembly Language Programming with Ubuntu
	Author(s)	Ed Jorgensen

Reference Book (s)			
	1.	Title of Book	
		Imprint details	
	2.	Title of Book	
		Imprint details	
	3.	Title of Book	
		Imprint details	
	Support Material(s)	a.	
		b.	
		c.	
		d.	

Short Description	This course provides an overview of the architecture and organization of a computer, such as the CPU, memory, I/O organization, peripherals and so on. From this course, students will learn the basics of computer architecture and low-level programming. i.e. assembly code and hardware manipulation.

Description of Course: *(not more than 250 words)*	This course will focus on the basic concepts of computer architecture and machine instructions; memory access and storage; instruction execution; assembly language; computer organization; data representation and transfer; digital arithmetic; memory storage and addressing methods; procedures and interrupts; conditional processing, and so on. Assembly language is the foundation language for modern computer applications. This course will introduce the Intel family of computers and its associated assembly language. As you learn assembly language you will also learn about the components of a typical computer system and how the operating system controls these components. Successfully completion of this course will provide students a comprehensive understanding of computer organization and architecture and enable him/her analyze and implement many practical problems with Assembly language.

Course Objectives (CO): ***(Brief & unambiguous)... at least 5 COs***

a. tend to describe specific, discrete units of knowledge and skill
b. can be accomplished within a short time frame - still may be relevant for a class period
*c. tend to be **STATEMENTS OF INTENT**; do not necessarily suggest that the behavior has been demonstrate*

1.	To introduce basic concepts of computer organization with emphasis on the lower-level abstraction of a computer system including instruction set architecture, addressing modes, memory models and assembly language programming.
2.	To illustrate the computer organization concepts by Assembly Language programming
3.	Introduction to x86 Architecture.
4.	Familiarization with Assembly Language directives, macros, operators, and program structures.
5.	Learning Programming methodology to be able to create system level software tools and application programs
6.	Understanding of interrelationship between hardware and software
7.	Comparison between different processors families
8.	

Learning Outcome (LO): ***(Brief & unambiguous-with reference to course objectives i.e. at least 5 LOs***

a. describe broad aspects of behavior which incorporate a wide range of knowledge and skill
b. accomplished over time in several learning experiences
*c. refer to **DEMONSTRATIONS OF PERFORMANCE***

a.	Understanding of the major components of a computer and basics of computer organization
b.	Understanding of interconnection between computer modules and functions
c.	Understanding of the internal working of central processing unit
d.	Understanding of Instruction set architecture. addressing modes and formats
e.	Understanding of Assembly language Programming Concepts for intel x86 processor (Data types, Functions Control Structures, Loops, Procedures, Arrays, Pointers, Stack, Strings, Interrupts, file handling)
f.	

Courseware Structure: **(Mark X where applies)**

Lecture (Lect)	*Multimedia (MM)*	*Exercise (s) (Exer)*	*Labs (Lab)*	*Case Studies (CAS)*	*Assignment (s) (Assign)*	*Group Presentation (G-Pres)*	*Any other Medium Midterms*
X	X	X	X	X	X		X

Weeks	Contents/Topics
Week-01	**Introduction to the elements of computing systems** Review of the combinational logic design (Logic gates and their abstractions, Flipflops and their usage in designing registers, ALU, and RAM)
Week-02	**Abstraction to Instruction** Introduction to Assembly Language Types of Architectures, Intel Microprocessors, Understanding the first program (Assembler, Linker, and Debugger) Memory models
Week-03	**Addressing Modes** Data declaration and directives Direct addressing Register indirect addressing Register + offset addressing Other types of addressing modes
Week-04	**Branching** Conditions Jumps (Types of Jumps) Conditional Jumps
Week-05	**Teaching Multiplication to the computer** Shifting and rotations Multiplication in assembly Extended multiplication Logical and bitwise operations
Week-06	**Revision**
Week-07	**Stack** Intro to stack and subroutines Stack operations
Week-08	**Accessing the display memory** Display memory and ASCII codes Finding the location in the display memory DIV and MUL instructions
Week-09	**String Processing** String Instructions with examples
Week-10	**Interrupts**

Week-11	**Software Interrupts** Bios and DOS interrupt with examples
Week -12	**Revision**
Week 13	**Real-time Interrupts** I/O ports
Week-14	**Computer Arithmetic** Signed Multiplication
Week-15	**Computer Arithmetic** Fast Multiplication Integer Division Floating Point Numbers
Week-16	**Revision & System on chip**

Recommended Web links:

Grading Criteria			
	ABSOLUTE Grading		RELATIVE Grading

Marks Distribution:

Particulars	% Marks
1. Assignments	10
2. Quizzes	20
3. Mid Term-I	10
4. Mid Term-II	15
6. Final Exam	40
7. Any other-Class performance	5
Total:-	**100**

Planned Courseware Events:

Particulars	Planned (Qz/As/Labs)	Remarks
1. Quizzes	6	All quizzes announced
2. Assignments/	**>2 & <6**	
3. Presentations		
4. Labs	**< or = 14**	Individual Lab Exercises
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Academic and Moral Integrity:	**All assignments should be your own work (or your group's when approved). PLAGIARISM will be awarded with "F" grade and/or reported to the University for academic and moral misconduct. To protect yourself, ALWAYS PROVIDE REFERENCES!**