COURSE STRUCTURE

Name of Course: COMPUTER ARCHITECTURE

Course Code: DCS1102

Credit Hours: 4

Prerequisite/co-requisite: None

Summary:

This course covers the structure of computer system with concentration in the architecture of microprocessor, memory, sub-system, I/O sub-system, and Assembly language. It assumes some programming experience and equips students with knowledge of computer structure, operation and input/output facilities.

Course Learning Outcomes:

Upon completing this course, the students will be able to:

CLO1: Describe the architecture of N-bit microprocessor and the corresponding memory and I/O subsystem (C2, PLO1)

CLO2: Display the ability to apply basic assembly language in relation to microprocessor instruction set and addressing (P3, PLO3)

CLO3: Analyze the concept of memory organization, I/O organization, CISC vs RISC architecture of a computer system in relation to CPU functions and performance (C4, PLO2)

Course Format:

Total Student Learning Time (SLT) (L = Lecture; T = Tutorial; P = Practical; EL = E-Learning) :					
Learning Hours				**Independent Learning (hr)**	**Total Student Learning Time (hr)**
L	T	P	EL		
28	0	14	14	104	160

Teaching and Delivery Methods/ Teaching Methodology:

Lectures, Tutorial and Practical/Laboratory work delivered in a combination of blended & independent learning

E-Learning provided by INTI makes learning more accessible and convenient for the students. The blended model utilized by INTI is the integration of E-learning via INTI's Learning Management System and the conventional lecturer-led classroom activities. INTI students are required to access to the online learning materials (additional notes, reading materials, online assessments, discussion forums and etc.), so as to acquire a complete learning process. This also promotes self-directed learning in encouraging INTI students to be independent learners.

Syllabus:

	Course Content Outline	CLO*
1-2	**Introduction to Computer Technology** General definition of a computer system. Technological basis for such computers. The history of digital computer system.	1
3-4	**Number System and Data Representation** Introduction to number systems: Binary, Octave, Hexadecimal, and Decimal. Data representation in computer: signed & unsigned numbers, real numbers, BCD (Binary Coded Decimal), and ASCII code.	1,2
5-6	**N-bit microprocessor** Concept of stored program computer. Brief history of N-bit microprocessor development. Architecture of an actual microprocessor (8086). System buses. Fetch and execute cycle. Register Sets.	1, 2
7-8	**8086 Programming Model** The concept of segmented memory. Addressing Modes. Instruction set architecture (ISA).	1, 2
9-16	**8086 Instructions Set and Assembly Language Programming** Various type of instructions including data transfer instructions, arithmetic instructions, logical instructions, branch instructions, PUSH & POP instructions, and flags control instructions. Assembly language programming in assembly language environment. DOS and BIOS services for I/O control. Procedures call.	1,2
17-20	**Memory Organisation** Memory hierarchy. Cache memory. Memory management in real mode and protected mode. Segmented memory and memory paging. Virtual Memory.	1, 3
21-24	**I/O Organisation** I/O address mapping. I/O programming. CPU - I/O interaction: polling, interrupt-driven, DMA.	1, 3
25-28	**CISC vs RISC architecture** 32-bit and 64-bit microprocessor. Architectures that helps to improve CPU performance: pipelining, superscalar, branch prediction, hyper threading.	3
	FINAL EXAMINATION	

Student Evaluation:

Continuous Assessment		**Percentage (%)**	**CLO**
1	Test	20	1
2	Lab Report	20	2
3	Assignment	20	3
Final Assessment		**Percentage (%)**	
Final Examination		40	1
Total		**100%**	

Final exam format:
Duration: 2 hours

Students are required to answer FOUR Structured questions. All questions carry equal marks.

Grading Scale:
A+ (90-100), A (80-89), A- (75-79), B+ (70-74), B (65-69), B- (60-64), C+ (55-59), C (50-54), C- (45-49), D (40-44), F (0-39), Resit Pass, RP (50-100), Resit Fail, RF (0-49)

IMPORTANT NOTE:
Students are required to "**PASS**" BOTH continuous and final assessment in order to pass the subject.

Additional Information: Examples of application tools such as DOSBOX, TASM and EMU8086 Emulator

Main Reference(s) Supporting Course:

1. Linda Null (2019), Essentials of Computer Organization and Architecture, 5th Edition, Jones & Bartlett Learning.
2. Gerard Prudhomme (2018), Introduction to Assembly Language Programming, Arcler Education Inc, ISBN13:9781773614700

Additional References:
1. Daniel Kusswurm (2018), Modern X86 Assembly Language Programming, Apress. eBook ISBN 978-1-4842-4063-2

LABORATORY WORK:

Lab	Practical Work
1	Number Systems
2	Data Representation
3	Data Transfer and Arithmetic instructions (MOV, ADD, SUB, MUL, DIV, CMP, DEC, INC, NEG)
4	Logical Instructions - AND, NOT, XOR, OR, TEST
5	Bit Manipulation 1 - ROR, ROL, RCL, RCR
6	Bit Manipulation 2 - SHL, SHR, SAL, SAR
7	Memory Registers and ASM Instructions