National Computer Education Accreditation Council

NCEAC

NCEAC.FORM.001-C

INSTITUTION **National University of Computer and Emerging Sciences, Karachi Campus**

PROGRAM (S) TO BE EVALUATED BS (CS), Fall 2024

A. Course Description

(Fill out the following table for each course in your computer science curriculum. A filled out form should not be more than 2-3 pages.)

Course Code	EE-2003
Course Title	Computer Organization and Assembly Language
Credit Hours	3 + 1
Prerequisites by Course(s) and Topics	ITC, DLD
Assessment Instruments with Weights (homework, quizzes, midterms, final, programming assignments, lab work, etc.)	Midterms 15 x 2 = 30 marks Assignments 10 marks Quiz 10 marks Final Exam 50 marks
Course Coordinator	Mr. Shoaib Rauf
URL (if any)	
Current Catalog Description	
Textbook (or **Laboratory Manual** for Laboratory Courses)	Assembly Language for Intel Based Computers K.Irvine 6th Edition MIPS Assembly Language Programming by Ed Jorgensen, Version 1.1.35 April 2018
Reference Material	Computer organization and design: the hardware/software interface by David A. Patterson and John L. Hennessy Computer Organization & Embedded Systems Hamacher et al. 6th Ed.
Course Goals	- Programming Methodology of low-level languages - How to access computer hardware directly - Overview of a user-visible architecture (of Intel 80x86 processors) - Intel 80x86 instruction set, assembler directives, macro, etc. - How programs interact with the operating system for various services including memory management and input/output services How is it possible to interface high-level language and low-level language modules

Topics Covered in the Course, with Number of Lectures on Each Topic (assume 15-week instruction and one-hour lectures)	**Week 1: Introduction to Basic Concepts, Intel 80x86 Processor Architecture** Basic microcomputer architecture CLO1
	Week 2: Instruction execution cycle, memory management, input and output systems CLO1
	Week 3: Assembly Language Fundamentals: Assembling, Linking and debugging, defining constants and variables, Real and Protected mode Addressing and Programming **CLO2**
	Week 4: Data transfer and Arithmetic Instructions, Addressing Modes **CLO2**
	Week 5: Operators and directives, Introduction to control transfer instructions, Arrays and loops, (Addressing modes Contd.) **CLO2**
	Week 6: **FIRST MID TERM EXAMINATION**
	Week 7: Procedures and Stack operations, Runtime stack, PUSH and POP instructions. **CLO4**
	Week 8: Conditional Processing Boolean and comparison instruction, conditional jumps, conditional loop structures, high-level language constructs **CLO2**
	Week 9: Conditional Processing (Contd.) Boolean and comparison instruction, conditional jumps, conditional loop instructions, high-level language constructs **CLO2**
	Week 10: Integer Arithmetic Shift & Rotate, Multiplication & Division instructions, Extended Addition & Subtraction **CLO2**
	Week 11: SECOND MID TERM EXAM
	Week 12: Advanced Procedures – Introduction and Examples: Stack Frames, Recursion, INVOKE, ADDR, PROC, PROTO Directives CLO1,CLO2, **CLO4**
	Week 13: String and Arrays String primitive Instructions, Two dimensional array **CLO2**

<table>
<tr><td></td><td colspan="4">Week 14: Machine Language Translation
Instruction Formats, encoding an Instruction Set and Modes of Addressing, Translation and Working of an Assembler, Map File and Memory Map
CLO3
High level language Interfacing
Introduction, .model directive, Inline Assembly Code, Procedures Linking to an external library
CLO5
Week 15 and 16: MIPS Architecture and Assembly Programming;
Introduction to MIPS Assembly
CISC vs RISC
ILP: Pipelining, Hazards
CLO 1 and CLO2</td></tr>
<tr><td>Laboratory Projects/Experiments</td><td colspan="4">Lab manual available separately</td></tr>
<tr><td>Programming Assignments Done in the Course</td><td colspan="4">4 Assignments will be given on the google classroom.</td></tr>
<tr><td rowspan="2">Class Time Spent on (in credit hours)</td><td>Theory</td><td>Problem Analysis</td><td>Solution Design</td><td>Social and Ethical Issues</td></tr>
<tr><td>20</td><td>15</td><td>15</td><td>5</td></tr>
<tr><td>Oral and Written Communications</td><td colspan="4">Every student is required to submit a project along with its report of not more than 10 pages.</td></tr>
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PLO	Program Learning Outcome (PLO) Statement
02	**Problem Analysis:** Ability to identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
05	**Modern Tool Usage:** Ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities, with an understanding of the limitations.

CLO	Course Learning Outcome (CLO)	Domain	Taxonomy Level	PLO	Tools
01	Illustrate micro-architectures of x86 and RISC processors	Cognitive	3	05	A1, Q1, M1, F
02	Create basic assembly code using different type of addressing modes in x86 & RISC ISAs to solve simple-moderate problems	Cognitive	4	02	A2, M1, F
03	Apply translation of machine instructions into binary code and visa versa.	Cognitive	5	05	A2, A3, Q1, M1, M2, F
04	Illustrate use of stack during a parametrized function/procedure call that uses local variables.	Cognitive	5	05	A3, M2, F
05	Justify need to use assembly code along with a high-level language code	Cognitive	5	05	Q2,A3, M2, F
Tool: A = Assignment, Q = Quiz, M = Midterm, F=Final					