Course Specification

(Bachelor)

Course Title:	Computer Organization and Assembly Language
Course Code:	CSC1202
Program:	Bachelor in Computer Science
Department:	Computer Science
College:	Computers and Information Technology
Institution:	University of Tabuk
Version:	1.0
Last Revision Date:	27 July 2022

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (4 hours)					
2. Course type					
A.	☐University	☒ College	☐Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 3/Second Year)					
4. Course general Description:					
The course provides a comprehensive and up-to-date coverage of computer organization and Assembly language programming. Students are introduced to data representation, microprocessor functionality, memory organization, external storage, bus architecture, and input/output devices. Furthermore, the students learn nature of assembly language and how to write an assembly program. They will develop a simple application in assembly on different computational platforms.					
5. Pre-requirements for this course (if any)**:**					
Introduction to Programming-CSC1103					
6. Co-requisites for this course (if any)**:**					
N/A					
7. Course Main Objective(s):					
• **Understand the organization of the computer.** • **Identify the role and representation of data in the computer.** • **Identify the role of each component and distinguish its effect on the computer performance.** • **Integrate the major PC components; explain the purpose of each one, and how they collaborate to execute computer instructions.** • **Understand and analyze the nature of a computer instruction-set and addressing mode and explore the interaction between the CPU -memory and I/O peripheral devices.** • **Develop a simple application using assembly language.**					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	75	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	30
3.	**Field**	0
4.	**Tutorial**	0
5.	**Others (specify)**	0
Total		75

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Recognize the requirements of the problems	K3	• **Lectures** • **Group Discussion** • **Research Activities**	• **Class Works** • **Home Works** • **Exams**
1.2	Identify the components of algorithmic solutions such as inputs, outputs, variables, types, data structures, processes, decisions, and loops	K2	• **Lectures** • **Group Discussion** • **Research Activities**	• **Class Works** • **Home Works** • **Exams**

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.3	Understand the theory, algorithm and design of algorithmic solutions	K4	• Lectures • Group Discussion • Research Activities	• Class Works • Home Works • Exams
1.4	Recognize the interface between computer hardware organization and software through instruction set architecture	K3	• Lectures • Group Discussion • Research Activities	• Class Works • Home Works • Exams
2.0	**Skills**			
2.1	Use appropriate logic and computer syntax for solution development-coded should be correct, concise, and clear	S1	• Lectures • Group Discussion • Research Activities • Labs	• Exams • Class Works • Home Works • Lab Works • Lab Exam
2.2	Test and walkthrough the correctness of algorithmic solutions	S3	• Lectures • Group Discussion • Research Activities • Labs	• Exams • Class Works • Home Works • Lab Works • Lab Exam
2.3	Analyze the interface between computer hardware organization and software through instruction set architecture.	S2	• Lectures • Group Discussion • Research Activities • Labs	• Exams • Class Works • Home Works • Lab Works • Lab Exam
3.0	**Values, autonomy, and responsibility**			
	N/A			

C. Course Content

No	List of Topics	Contact Hours
1.	**Basic Concepts and Computer Evolution (Part1):** **Introduction to Organization and architecture, Structure and function.** **Lab: : Introducing the EMU8086 software to the students and how to install and compile programs.**	**5**
2.	**Basic Concepts and Computer Evolution (Part2):**	**5**

	Brief history of computers, The First Generation: Vacuum tubes, The Second Generation: Transistors, The Third Generation: Integrated Circuits, Later generations, The evolution of the Intel x86 architecture Lab: Implementing the Movement instructions	
3.	Basic Concepts and Computer Evolution (Part3): Cloud computing: Basic concepts, Cloud services. Embedded systems: The Internet of things, Embedded operating systems, Application processors versus dedicated processors, Microprocessors versus microcontrollers, Embedded versus deeply embedded systems. ARM architecture. Lab: Implementing the arithmetic instructions part1	5
4.	A Top-level View of Computer Function and interconnect (Part1): Computer components, Computer function Instruction fetch and execute, Interrupts, I/O function. Lab: Implementing the arithmetic instructions part2	5
5.	A Top-level View of Computer Function and interconnect (Part2): Interconnection structures, Bus interconnection Lab: Writing Assembly program with arithmetic expression	5
6.	A Top-level View of Computer Function and interconnect (Part3): Point-to-point interconnect: physical layer, QPI link layer, QPI routing layer QPI protocol layer. PCI express: PCI physical and logical architecture, PCIe physical layer, PCIe transaction layer, PCIe data link layer. Lab: Define variables and implementing the Loop instruction	
7.	Cache Memory (Part1): Computer memory system overview, Characteristics of Memory Systems Memory Hierarchy, Cache memory principles. Lab: implementing Conditional and Unconditional Instructions part1	5
8.	Cache Memory (Part2): Elements of cache design: Cache addresses, Cache size, Mapping function, Replacement algorithms, Write policy, Line size, Number of caches. Lab: implementing Conditional and Unconditional Instructions part2	5
9.	Internal Memory (Part1): Semiconductor main memory: Organization, DRAM and SRAM, Types of ROM, Chip logic, Chip packaging, Module organization, Interleaved memory. Error Correction. Lab: implementing Conditional and Unconditional Instructions part3	5
10.	Internal Memory (Part2): DDR DRAM: Synchronous DRAM, DDR SDRAM. Flash memory: Operation, NOR and NAND flash memory. Newer nonvolatile solid-state memory technologies. Lab: implementing logical instructions.	5
11.	External Memory (Part1): Magnetic disk: Magnetic read and write mechanisms, Data organization and formatting, Physical characteristics, Disk performance parameters, RAID. Lab: implementing Stack instructions.	
12.	External Memory (Part2): Solid state drives: SSD compared to HDD, SSD organization, Practical issues. Optical memory: Compact disk, Digital versatile disk, High-definition optical disks. Magnetic tape. Lab: Writing Procedures in Assembly part1	
13.	Instruction Sets: Characteristics and Functions (Part1):	5

	Machine instruction characteristics: Elements of a machine instruction, Instruction representation, Instruction types, Number of addresses, Instruction set design. Types of operands: Numbers, Characters, Logical data. Lab: Writing Procedures in Assembly part2	
14.	Instruction Sets: Characteristics and Functions (Part2): Intel x86 and ARM data types. Types of operations: Data transfer, Arithmetic, Logical, Conversion, Input/output, System control, Transfer of control. Intel x86 and ARM operation types. Lab: Revision with different assembly programs	5
15.	Instruction Sets: Addressing Modes and Formats: Addressing modes: Immediate addressing, Direct addressing, Indirect addressing, Register addressing, Register indirect addressing, Displacement addressing, Stack addressing. Instruction formats: Instruction length, Allocation of bits, Variable-length instructions. Lab: Revision with different assembly programs	5
Total		75

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Class Works *(*Class Activities*, Quizzes, Group Discussion Reports)* and Home works *(Individual Assignments, Group Assignments)*	1 - 15	10%
2.	Lab works and Lab Exam	3 - 15	20%
3.	Mid-Term 1	6-7	15%
4.	Mid-Term 2	11-12	15%
5.	Final Exam	17	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	1)Computer Organization and Architecture (11th Edition) , Pearson, 2018, by William Stallings. ISBN-10 : 0134997190 ISBN-13 : 978-0134997193 2)The Intel Microprocessors, 8/e, Barry B. Brey; 2009; Prentice Hall; 944pp; ISBN-13: 9780135026458

Supportive References	**1)Structured Computer Organization (6th Edition)Aug 4, Prentice Hall, 2012, by Andrew S. Tanenbaum and Todd Austin 2)Principles of Computer Organization and Assembly Language, 1/e Juola; 2007; Prentice Hall; 439 pp; ISBN-10: 0131486837 | ISBN-13: 9780131486836**
Electronic Materials	**http://WilliamStallings.com/COA/COA7e.html http://WilliamStallings.com/StudentSupport.html http://members.ee.net/brey**
Other Learning Materials	**Intel x86 Emulator "emu8086" Assembler Software "MASM32"**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	**Classroom (20 seats) Laboratory (20 seats)**
Technology equipment (projector, smart board, software)	**Data Show Intel x86 Emulator "emu8086"**
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of Teaching	Faculty, Program Leaders, and Advisory Board	Both Direct and Indirect
	Students	Indirect
Effectiveness of Students Assessment	Faculty, Program Leaders, Advisory Board, and Independent Opinion	Both Direct and Indirect
Quality of Learning Resources	Faculty, Students, and Advisory Board	Indirect
The Extent to which CLOs have been Achieved	Faculty, Program Leaders, Advisory Board, and Independent Opinion	Direct (as in section B) and Indirect/Surveys
	Students	Indirect
Other	-	-

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	

REFERENCE NO.	
DATE	