CS2116: COMPUTER SYSTEMS

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Computer Systems

Subject Code
CS - Computer Science
Course Number
2116

Academic Unit
Computer Science (CS)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

This course aims to introduce the logic design techniques in the construction of the functional parts of a CPU and fundamental components and principles of operation of computer systems.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe functions of the basic building blocks of a digital system.			x	
2	Make critique and assessment on various architectures and the design concepts for analyzing computer systems.			x	
3	Explore the basic operations of cache and main memory, I/O operations, bus, interrupt and peripheral devices as well as assessing the performance of different designs.		x		
4	Write low-level programs for bitwise operation, function pointer, call-back function, and event interrupt using C or C++ language.			x	x

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Introduce the logic design techniques in the construction of the functional parts of a CPU and fundamental components and principles of operation of computer systems.	1, 2, 3, 4	3 hours/week
2	Tutorial	Students will be provided with some exercise questions to gain better understanding of the lecture materials. The instructor will explain the questions in detail.	1, 2, 3, 4	8 hours/semester

3	Assignment	Assignments will be given out during the semester. Assignments will be focusing on practical questions.	1, 2, 3	After class

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignment	1, 2, 3	10	It includes short factual questions and case studies regarding computer architecture. Quality of assignment Xcorrectness of answers and ability to apply knowledge) will be used to assess CILOs.
2	Lab Project	4	5	There will be three tutorials devoted to Arduino board experiments where the student need to upload their program to the Arduino board to fulfil some functionality. In total, there are three mini projects to complete.
3	Exam/quiz	1, 2, 3	15	Final exam and quiz will include questions assessing the students' understanding on architectural aspect of computer.

Continuous Assessment (%)

30

Examination (%)

70

Examination Duration (Hours)

2

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Assessment Rubrics (AR)

Assessment Task

Assignment

Criterion

ABILITY to SOLVE questions from different basic topics

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Lab Project

Criterion
ABILITY to write the right code to make the Arduino board work appropriately

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Final Exam/Quiz

Criterion
ABILITY to solve problems for different topics under time pressure

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

Number Systems. Logic Gates. Basic combinational circuits. Basic Computer Organization and Architecture. Cache, Main Memory and Flash Memory. Storage Device. Synchronous and Asynchronous Bus, Bus Arbitration. Parallel and Serial Interfaces, PCI Bus. Peripheral Devices. Low-level programming.

Syllabus

- Number systems
  Number representation. Binary arithmetic. Negative numbers. Floating point numbers and calculations, IEEE floating point.
- Digital logic fundamentals
  Logic gates. Basic combinational circuits. Examples with applications.
- Basic computer organization
  Functional subsystems: CPU, memory, input/output systems.
- CPU organization and operations
  Register model. Fetch and execute cycle. Instruction format. Control unit and microprogramming, case study on a typical microprocessor.
- Low-level programming
  Bitwise operator. Function pointer. Call-back function. Event interrupt.
- Memory system
  RAM, ROM. Cache memory. Flash memory.
- Peripherals
  Display technology. Interactive Display. Storage device.
- I/O and bus system
  Basic model of an I/O system. I/O interfaces including serial and parallel. PCI bus.

Reading List

Compulsory Readings

	Title
1	Hamacher, V.C., Vranesic, Z.G. and Zaky, S.G. (2011). Computer Organization and Embedded Systems. McGraw-Hill, 6th edition.
2	Mano, M.M., and Kime, C.R., (2007). Logic and Computer Design Fundamentals, Prentice-Hall, 4th edition.

Additional Readings

	Title
1	Tanenbaum, A. (2005). Structured Computer Organization. Prentice-Hall, 5th edition.
2	Stallings, W. (2009). Computer Organization and Architecture. Prentice-Hall, 8th edition.