

CS2116: COMPUTER SYSTEMS

Effective Term

Semester A 2025/26

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 Computing (CC)

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

The goal of this course is for students to learn the logic design techniques in constructing the functional parts of a CPU and the 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	Discuss the advantages and limitations of 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	Apply 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.

Learning and Teaching Activities (LTAs)

LTAs		Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Students will engage in formal lectures on logic design techniques for constructing 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	Students will engage in assignments during the semester. Assignments will be focusing on practical questions.	1, 2, 3	After class
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Assessment Tasks / Activities (ATs)

ATs	CILO No.	Weighting (%)	Remarks ("- " for nil entry)	Allow Use of GenAI?	
1	Written Assignment	1, 2, 3	10	It includes short factual questions and case studies regarding computer architecture. Quality of assignment (correctness of answers and ability to apply knowledge) will be used to assess CILOs.	Yes
2	Programming Assignment	4	5	There will be tutorials devoted to the Arduino board where the students will design programs for the Arduino board to fulfill some functionality.	Yes
3	Midterm	1, 2, 3, 4	15	The Midterm will include questions assessing the students' understanding of the architectural aspect of computers.	No

Continuous Assessment (%)

30

Examination (%)

70

Examination Duration (Hours)

2

Minimum Examination Passing Requirement (%)

30

Additional Information for ATs

The final exam will include questions assessing the students' understanding of the architectural aspect of the computers. 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

Written 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

Programming Assignment

Criterion

ABILITY to design and apply code to make the Arduino board perform the desired functionality.

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

Midterm

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

Assessment Task

Examination

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.