Module Specification – (Programme Specs Ver. 5) 2023/24

Module Code: 23CSCI10I	**Title:** Computer Architecture	
Level: 5	**Modular weight:** 10	**Faculty/Dept:** ICS/CS,SE,CN,IS
Pre-requisite modules: CSCI08C		
Reassessment: No restriction		
Module Leader: Dr. Noura El Maghawry		
Semester taught: One		
Date of latest revision: April 2020		

Aims

The module aims to impart fundamental knowledge of modern computer architectures in terms of instruction set architecture, organisation and hardware. It develops an understanding of the architectural features and the principles of operation of modern microprocessors and peripheral devices. The module further seeks to provide a sound understanding in the following:

- The main families of microprocessors and their differences;
- How computers execute their programs at machine instruction level; and
- Principles of the practical design of processor architectures and how design features influence machine coding and performance features.

Intended Learning Outcomes

On completion of this module students should be able to:

Knowledge and Understanding

1. To develop and demonstrate knowledge and understanding, abilities and skills in functionality of computer architecture and organization. [A1, A6, A7]

Intellectual Skills

2. Analyse and evaluate the impact of architectural design choices on system performance; the importance of memory organisation and caching on machine performance. [B3, B5]

General and Transferable Skills

3. Experiment the basic principles behind the design of modern computer systems; Differentiate between the features of the main architectural families. [C1]
4. Develop basic skills for computer architecture design; produce code in assembler and a hardware description language. [C2]
5. Develop an analytical approach to evaluating computer systems and competing commercial architectures. [C8]

Transferable skills

6. Gain experience describing technical design using specialist vocabulary. [D4]
7. Plan, develop, evaluate and report on individual pieces of work.[D6]

Employability

This module will provide opportunities for students to:

1. Understand the importance of being self-motivated in order to progress the area of work. [A5]
2. Make decisions by determining the best course of action and evaluating different options based on logic and fact in order to present solutions. [C 2.5]
3. Demonstrate determination to get things done and to constantly looking for better ways of doing things. [C2.6]
4. Carry out a range of complex ICT activities related to their work that involve computer architecture design. [B.3.1]
5. To analyse situations by gathering information systematically to establish facts and principles and to use this to be able to evaluate computer systems. [C.2.3]
6. Gathering information systematically to understand the set of rules and methods that describe the functionality, organization, and implementation of computer systems. [C.2.3]

Indicative Content

Part 1 Introduction

- Introduction to basic CPU architecture. Approaches to CPU design. Amdahl's Law.

Part 2 Different Architectures and Introducing Assembler

- Example architectures (e.g. ARM, iA64). Assembler, calling conventions, register usage, data path and control.
- Pipelining: implementation of a pipeline, hazards, bypasses, exception, assessing the performance.
- Memory interface: alignment, endian, cache organisation, virtual and physical addressing, and coherence.

Part 3 Performance enhancements

- Performance enhancements: Pipelining, cache memory, RISC vs CISC architectures, superscalar architectures, multi-threaded and trace-based architectures.
- Input/output design and implementation

Methods of Learning, Teaching and Assessment

Total student effort for the module: 100 hours on average over one semester.

Type of session	ILOs Covered	Typical Student Effort		
		Typical number in the semester/s	Typical hours per week	Total hours
Lecture	1-6	12	2	24
Tutorial	-	-	-	-
Laboratory	4-7	12	2	24
Private study	1-7	-	-	52

Assessment

Assessment Type	Weight %	ILOs Assessed	Exam Semester	Exam/ Written Coursework Length
Individual Assignment 1: The assignment requires the submission of a fully functioning code of the given problems, and a written solution to a theoretical	20	4-7	1	Assignment

problem. The type of problems for the first assignment is based on phases 1 and 2 of the indicative content.				
Individual Assignment 2: The assignment requires the submission of a fully functioning code of the given problems, and a written solution to a theoretical problem. The type of problems for the second assignment is based on phases 2 and 3 of the indicative content.	20	4-7	1	Assignment
Final Examination: The final exam will cover all parts of the indicative content to be solved theoretically.	60	1-4	2	120 minutes

Methods of Feedback

In response to assessed work:

- Feedback will be provided for each assessed component through posting model answers with detailed grading schema, and through face to face discussion. If students require additional feedback, they are welcome to speak with the TA, and the module-leader.
- Generic exam feedback will be given on the e-learning system.

Developmental feedback generated through teaching activities:

- Dialogue between students and staff in workshops and Labs.

Indicative Reading List

- Stallings, W., “Computer Organisation and Architecture”, 8th Edition, Prentice Hall, ISBN: 0130493074, (2010).
- M. Morris Mano, “Computer System Architecture”, 3rd Edition, Prentice Hall International Editions, (1993).