UNIVERSITY OF MAURITIUS
MODULE CATALOGUE

1. GENERAL INFORMATION

Academic Year: 2023-2024
Semester(s): 2

Title	Code	Duration (hrs)	No. of credits
Computer Architecture	ICT1201(1)	Lectures: 15	**3 ECTS**
		Tutorials/Practicals: 15	
		Self-study: 15	
		Other Learning Activities*: 45	
		Total Contact Hours: 30	

*working on assignments, sitting for Class Tests and preparation time for same, sitting for Examinations and preparation time for same, group work, attending Workshops/Conference recommended by the Department/Faculty, fieldwork, site visits/trips, additional practicals, presentations among peers, experiential learning, placements/internships and guest lectures.

2. PRE-REQUISITE(S)/PRE-REQUIREMENT(S)

None

3. AIMS

The module covers the main components of Computer Architecture. It aims at providing a broad spectrum of this topic that includes (1) the microprocessor-based system and the Operating System, (2) memory organization, (3) data transfer between memory and peripheral devices, (4) Elementary error detection and correction during data transfer, (5) pipelining and related hazards, (6) CPU and Disk scheduling algorithms, (7) an introduction to the MIPS Assembly language programming, and (8) the conversion from assembly language to machine code.

4. OUTLINE SYLLABUS

Through Contact Hours:
Functional organization of a computer, machine-level representation of data and program, Assembly level machine organization and programming, role of programming languages, Libraries and Operating Systems, Types of memory, Interruptions and I/O, CPU and Disk scheduling algorithms

Through Self-Learning:

Types of processors, Evolution of the microprocessor - size (bits), clock speed (Hz), generation, type (RISC/CISC), Secondary storage devices, Disk partitioning, Components required to assemble a PC from scratch, Additional instructions from the MIPS assembly language.

5. LEARNING OUTCOMES AND ASSESSMENT CRITERIA

Having studied this module, the students should be able to achieve the following learning outcomes. The assessment criteria used to reflect the expected learning outcomes are also given hereunder:

Learning Outcomes	Assessment Criteria
➢ Learn about the microprocessor-based system	➢ Understand the functions of the microprocessor and memory ➢ Understand the main components working around the microprocessor ➢ Ability to compare the performances of computer systems ➢ Learn to use different metrics in the computation of performance ➢ Understand the factors to consider for improving performance
➢ Learn about how the peripherals and the microprocessor-based system interacts	➢ Differentiate between the Input Output Techniques ➢ Understand the principle behind Direct Memory Access ➢ Understand how error detection and correction is performed when data is transferred ➢ Understand the mapping of main memory to cache
➢ Learn about CPU and disks scheduling algorithms/policies	➢ Understand how the scheduling of a process takes place ➢ Understand the main scheduling algorithms for scheduling processes ➢ Ability to simulate the scheduling algorithms when given a set of processes with their respective service time required ➢ Learn about the parameters to consider when measuring the performance of a disk ➢ Understand and simulate the major disk scheduling policies

➢ Learn about how pipelining is used to improve performance	➢ Understand how the running of instructions can be rearranged to increase the performance of the CPU ➢ Understand the potential hazards that can be introduced with the use of pipelining
➢ Learn to write programs using MIPS Assembly Language	➢ Write simple programs in Assembly Language ➢ Translate Assembly Language into Machine Code

6. COORDINATORS

	Programme Coordinator	Area Coordinator (if applicable)	Module Coordinator
Name	Baby Gobin		Paramasiven Appavoo
Department	Software and Information Systems,		Information and Communication Technologies
Building	FoICDT		FoICDT
Room Number			2.18A
Phone No.			403 7751
E-mail address			p.appavoo@uom.ac.mu
Consultation Time			09:00 to 16:00 on weekdays (on appointment)

7. LECTURER(S)

Name	Paramasiven Appavoo	
Department	Information and Communication Technologies	
Building	FoICDT	
Room Number	2.18A	
Phone No.	403 7751	
E-mail address	p.appavoo@uom.ac.mu	
Contact Hours	Fridays (13:00 - 16:00)	
Consultation Time	09:00 to 16:00 on weekdays (on appointment)	
Contact Address (for P/T)		

8. VENUE AND HOURS/WEEK

All lectures will be held online. Tutorials and practical sessions will be held on campus.

Hours/week: 3 hours

9. MODULE MAP

Week	Topics	DC	SS	OA
	START OF SEMESTER TWO			
1	Introduction to Computer Architecture • A Microprocessor-based system • Memory • I/O devices • System bus • Low/High level languages • Compilers/Interpreters • Operating System	3	2	3
2	Data Transfer between Memory and Peripheral Devices • Microprocessor operations • I/O interfaces • I/O techniques o Programmed I/O o Interrupt-Driven I/O o Direct Memory Access (DMA)	3	2	2
3	Memory • Memory Organization • Memory Classification • Memory operations • Hit ratio • Direct mapping of main memory to cache • Virtual Memory	3	1	5
	Deadline for Assignment #1			
4	Elementary Error Detection and Correction • Binary number system • Parity checks • Hamming codes • Check bits	3	2	5

			DC		
	Quiz				

5	Performance measurement
	
	   • MIPS
	   • MFLOPS
	   • Amdahl's Law
	   • Speedup
		3	2	5

6	Pipelining
	
	   • Introduction to Pipelining
	   • Structural Hazards
	   • Data Hazards
	   • Control Hazards.
		3	1	5

	Test #1				

7, 8	MIPS Assembly Language Programming
	
	   • Arithmetic
	   • Data transfer
	   • Conditional Branching
	   • Unconditional Branching / Jumping
	   • Logical operations
		6	3	10

9	CPU scheduling
	
	   • Operating Systems Concept
	   • Processes
	   • Threads
	   • CPU Scheduling
		3	1	5

	Deadline for Assignment #2				

10	Disk scheduling
	
	   • Disk performance parameters
	   • Disks Scheduling
		3	1	5

	Test #2				
	Total	**30**	**15**	**45**

*Abbreviations: **DC**: Direct Contact; **SS**: Self Study; **OA**: Other Learning Activities*

*   **DC** includes **L**: Lectures, **P**: Practicals, **T**: Tutorials;*

10. RECOMMENDED BOOKS/JOURNALS/WEBSITES

Microprocessor Architecture, Programming and Applications by Ramesh S. Gaonkar.

Computer Organization and Design: The Hardware/Software Interface by Patterson & Hennessy.

Structured Computer Organization by Andrew S. Tanenbaum.

Kann, Charles W., "Introduction To MIPS Assembly Language Programming" (2015). Open Textbooks.

https://academo.org/demos/logic-gate-simulator/

11. TEST(S)/ASSIGNMENT(S)/PRACTICAL(S)

Semester	Title	Max Marks
2	Quiz (week 4) Covering week 1 - 3	10
	Class Test 1 (*after Week 6*) Topics assessed: Lecture 1 - 5	20
	Class Test 2 (*after Week 10*) Topics assessed: Lecture 6 - 10	25
	Assignment 1 (individual): Building your own PC You are required to (1) lay out your respective requirements, (2) investigate all components of the PC, (3) select your motherboard, and (4) label the main components on the motherboard. All the selected components/parts should be "compatible" with the chosen motherboard. You also need to select an OS for your PC based on your requirements that justifies any cost associated with the OS. Compare and contrast with open source alternatives. *Deadline: End of Week 3*	10
	Assignment 2 (Group of 2 students): Design and implement a program to compute the maximum, minimum and sum of a set of numbers entered by the user. The user is limited to a maximum of 10 numbers. In this assignment, you are also required to investigate and use MIPS subprograms to reduce the lines of code. Platform: MIPS assembly language in MARS *Deadline: End of Week 9*	30

There will be a penalty for late submission of assignments. Submissions are closed one week after the prescribed deadline.

12. ASSESSMENT

(i) Continuous Assessment

	Weighting (100%)
Assignment(s):	40
Quiz:	10
Test(s):	45
Class participation:	5
Total Marks:	**100**

13. OFFICE HOURS
Monday to Friday from 9:00 to 16:00 (on appointment)

14. PORTFOLIO REQUIREMENT

All students should keep a portfolio of all coursework for their respective Programme of studies and same should be made available upon request, to the Faculty/Centre Examination Office.

15. OTHER INFORMATION

Plagiarism and cheating will not be tolerated. It will be dealt with according to the policies of the University of Mauritius regarding academic dishonesty. Please read these policies at http://mysites.uom.ac.mu/uomintranet/students/Student_Charter.pdf.

16. APPROVAL BY HEAD OF DEPARTMENT/OIC, CILL

Module Catalogue approved at Departmental Meeting *(where applicable)* on: …………………..

Head of Department/OiC, CILL Signature: ……………...

A copy of the approved Module Catalogue has to be submitted to the relevant Dean of Faculty for records purposes.