



Computer Architecture

1.0 Faculty Information

Name: Md. Toukir Ahmed

Email: toukircse14@gmail.com

2.0 Course Information

Course Title and Month Year	Computer Architecture
Class days (For synchronous course)	Specify weekday
Class time (For synchronous course)	Specify time during day/night
Course total contact hours	35 Hrs.
Class location	NSRIC online platform
Prerequisites and/or co-requisites	N/A
Level: A, C, E, H, I, K12, M, P, S, T, U, V, W	Undergraduate / U

Note: The below classification of courses is related any areas of knowledge:

A: Advanced level academic level courses; **C:** Canadian Immigration Training Program; **E:** Executive courses; **H:** Higher-level courses (i.e., graduate courses); **I:** Intermediate courses (i.e., university preparatory courses – Grade XII+); **K12:** Foundational, and lower-level courses; **M:** Mid-level courses (i.e., undergraduate courses); **P:** Professional courses; **S:** Short/seminar courses; **T:** Training courses; **U:** Tutorial Courses; **V:** Vocational training courses; and **W:** Workshop courses.

3.0 Professor Information

Name	Md. Toukir Ahmed
Title	Instructor
Contact Information	toukircse14@gmail.com
Office Location	NSRIC online platform
Office Hours	35 Hrs.

4.0 Course Description

This course is designed to introduce students to the basic concepts of computers, their design and how they work. It encompasses the definition of the machine's instruction set architecture, its use in creating a program, and its implementation in hardware. The course addresses the

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bridge between gate logic and executable software, and includes programming both in assembly language (representing software) and HDL (representing hardware).

5.0 Course Learning Outcomes

Upon successful completion of this course, students will be able to:

- CLO1: Understand the overview, Computer System, Arithmetic and logic, Central processing unit and parallel organization.
- CLO2: Understand the Computer and Processor Design, Hazards; Exceptions; external and internal memory Pipeline and multiple processor systems.
- CLO3: Develop and design an instruction set architecture and subsystems of central processing unit.
- CLO4: Develop the communication skill by presenting topics on Computer Architecture.

6.0 Course Materials

Online course materials

- 1) Online PowerPoint presentation slides in pdf form, and video/audio recording of lectures

Textbook and resources (If any)

- 1) William Stalling (11th Edition, 2021). Computer Organization and Architecture. ISBN-13 978-1292420103, Publisher: Pearson.
- 2) Andrew S. Tanenbaum (6th Edition, 2016). Structured Computer Organization ISBN-13 978-9332571242, Publisher: Pearson India.

7.0 Academic Integrity

Students are encouraged to have a look at the NSRIC's statement of academic integrity at NSRIC website. It is noted that by signing this syllabus, you will acknowledge that you have understood that any detected plagiarism should be reported.

8.0 Assessment for Grade

The course grade is only related to the academic courses (i.e., K12, and university level courses) based on individual and team performance as shown in Table 1:

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Table 1: NSRIC grading system

Type of Assessment	Grade %
Participation/Engagement/Performance	20%
Assignments	15%
Quizzes	20%
Midterm Exam I	15%
Midterm Exam II	15%
Final Exam	15%
Total	100%

Important Note:

- i) The below classified courses (i.e., academic courses) will only be evaluated based on the grade system shown in Table 2. A grade and certificate will be issued for the student(s) and participant(s).
A: Advanced level academic level courses; **H:** Higher-level courses (i.e., graduate courses); **I:** Intermediate courses (i.e., university preparatory courses – Grade XII+); **K12:** Foundational, and lower-level courses; **M:** Mid-level courses (i.e., undergraduate courses).
- ii) The below classified courses will **not** be evaluated based on the grade system shown in Table 2. A certificate will be issued for the student(s) and participant(s).
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Participation/Engagement/Performance

Your participation in every aspect of the course is important for the learning process. Your engagement in every discussion in the course, due delivery of all assignments, quizzes, and research projects will be fruitful. These efforts from your side will reflect your performance in the course delivery and your commitments. This performance is the reflection of your dream grade!!

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Assignments

You will be given **5 assignments** during the course delivery. The due dates for assignments are specified in the course content and schedule section. The assignments will be given time to time to solve/answer during the term. Assignments will be posted through NSRIC online platform at least one week before they are due. Due dates are given in course schedule (tentative schedule). However, in case of any special circumstance, the date will be posted beforehand or announced in class.

Quizzes

A **Maximum of five** quizzes (maximum of **five MCQ @ five minute**) will be taken based on class lectures and performance. The quiz will be taken in the beginning of the lecture through NSRIC online platform. If you miss the quiz without any valid official excuse, you will receive **zero** for the non-attended quiz. If any student fails to attend the quiz, he/she must submit a valid reason to the instructor. In such case, he/she should appear another quiz or may be averaged on the quizzes that he/she attended. It will depend on the situation and instructor.

Research Project and presentation

Each student will be assigned a topic related to the course material by the instructor. Each student will submit a research project report. The student will present his/her work during the class (5 min presentation + 5 min discussion). Additional information is available at term project guideline.

Midterm and Final Exams

Two midterm exams and one final exam will be taken according to the NSRIC policies and guideline. The exams would be through NSRIC online platform. The midterm and final exams dates would be announced by the course instructor/NSRIC administration.

9.0 Grading Scale of the Course

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At the end of the term, the below Table 2 will be used for translating your marks into a “Letter Grade” based on NSRIC grading policy.

Table 2: NSRIC grading system

Marks	Letter Grade	Points	Description
≥ 93	A+	4.00	Outstanding
≥ 90	A	3.75	
≥ 87	A-	3.50	Excellent
≥ 84	B+	3.25	Very good
≥ 81	B	3.0	
≥ 78	B-	2.75	Moderately Good
≥ 75	C+	2.50	Good
≥ 72	C	2.25	
≥ 69	C-	2.0	Moderately Good
≥ 66	D+	1.75	Pass
≥ 63	D	1.50	
≥ 60	D-	1.25	Poor Pass
< 60	F	0	Failing

10.0 Advice and additional requirements

I advise you to:

- Please contact me if you need any help.
- Students are expected to attend all scheduled online lecture classes.
- Students are expected to study from the course materials and/or textbooks which will help to easily read and understand.
- Students are encouraged to write their own notes during lectures/presentations (pdf PowerPoint presentations, and additional materials if any).
- Students are encouraged to attend online platform classes on time because late-attendee disrupts the flow of the class for both the instructor and the other students.

Additional information (During Online Course offering Period)

- The PowerPoint course materials, and video lectures will be available at the NSRIC Platform.

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- There will be scheduled discussion/tutorial sessions on **every Sunday** at the class scheduled time. All students must attend this session.
- There will be an office hour for students on Sunday from 1:00 pm – 2:00 pm, Toronto, Canada time. Students need to send an email request so that a zoom meeting can be arranged. In addition, any time student can set up an online appointment (i.e., phone, zoom, and/or other mode of communications) based on availability of the course instructor. However, student should send an email request for setting up this type of meeting.

11.0 Course Topics

- Fundamentals of Computer Organization and Architecture
- Computer Function and Interconnection
- Multiprocessors
- Cache Memory
- Internal Memory
- External Memory
- Input/ Output
- Operating System Support
- Processor design
- Control Unit design
- Pipeline
- Parallel Processing
- Superscalar Processors
- Parallel Organization

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12.0 Course Contents and Schedule

Lec No.	Module	Topics	Remarks
1.	Fundamentals, Architectural Evolution	Fundamentals of computer Design, Computer Architectural Evolution	
2.	Performance	Performance Assessment	
3.	Computer Components	Computer Components and their Functions(1) A summary and problem/workout example session (1)	
4.	Interrupt	Interrupt & Interconnection Structures	
5.	Bus Architecture	Bus Architecture	Quiz 1
6.	Computer Memory	Computer Memory System	
7.	Cache	Cache Memory Principles(2) A summary and problem/workout example session (2)	
8.	Cache	Cache Design	Quiz 2
9.	Internal Memory, DRAM	Internal Memory Technology, Advanced DRAM organization	Assignment 1 due
10		Mid Term Exam 1	10th Lecture
11	External Memory	External Memory (Magnetic disk)	Quiz 3
12	External Memory	External Memory (RAID, Optical Memory, Magnetic Tape) (3) A summary and problem/workout example session (3)	
13	Input-Output	Input-Output Organization	
14	Interrupt Processing	Interrupt Processing and DMA	Assignment 2 due
15	External Interface	The External Interface	
16	Operating system	Operating system support	
17	Memory Management	Memory Management System	
18	Memory Management	Memory Management System(Cont.)	Assignment 3 due
19	Number System	Number System(4)	
20	Number System	A summary and problem/workout example session Pore pressure calculations (4)	
21	Computer Arithmetic	Computer Arithmetic	

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22	Computer Arithmetic	Computer Arithmetic(Cont.)	
23	Digital Logic	Digital Logic	
24	Digital Logic	Digital Logic(Cont.)	
25	TA Prob. session	Conduct session for workout examples	Quiz 4
26		Mid Term Exam 2	26th Lecture
27	Processor structure and Function	Processor Organization	
28	Processor structure and Function	Pipelining	Assignment 4 due
29	RISC & CISC	RISC & CISC	
30	Parallel Processing	Parallel Processing	
31	Instruction format	Instruction format	Quiz 5
32	Data Path	Data Path	
33	Review	Review the Lectures	
34	Review	Review the Lectures	Assignment 5 due
35	Final Exam	TBA	

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