Computer Science COMP-2476-FAO
Introduction to Assembly Language & Operating Systems

Instructor Information:

Instructor: Dr. Thiago E. A. de Oliveira
Office Location: OR1016
E-mail: talvesd [at] lakeheadu.ca
Office Hours: Friday. 2:30PM - 5:30PM - (if needed, book by email and I will return a Zoom link)

Teaching Assistant: To be defined **TA Email:** To be defined.

Course Delivery:

Lectures: Wednesdays, 2:30 – 4:30 PM
Labs: Friday, 12:30 – 2:30 PM
Where: OA 2017 (LEC)
Dates: 2023-09-05 - 2023-12-04, (***Study Week***: October 9 - 13, 2023)
Final Date to Withdraw (Drop): Friday, November 3rd, 2023.

Attendance and participation in lectures are highly recommended!

Pre-requisites: COMP-1431 Computer Programming II.

Description:

Assembly-level machine organization. Memory system organization and architecture. Writing simple I/O routines and interrupt handlers. Introduction to initialization and process management in a Unix or Unix-like operating system.

Course Learning Objectives:

By the end of this course, students will be able to:

1. After completing this course, students should be able to comprehend and explain the fundamental concepts of assembly-level machine organization, including the structure of the CPU, registers, and basic instruction execution.
2. Students will gain the skills and knowledge required to analyze memory systems, including an understanding of different memory types, addressing modes, and memory hierarchy. They will be able to make informed decisions about memory system architecture.
3. Upon completing the course, students will have the capability to write basic input/output (I/O) routines and interrupt handlers, allowing them to interface with hardware and manage hardware events effectively.
4. Students will be introduced to the concepts of initialization and process management within Unix or Unix-like operating systems. They will acquire a foundational understanding of how these

operating systems function, preparing them for more advanced topics in operating system design and administration.

Course Outline:

1. Basic Concepts, Data Representation and Boolean Expressions
2. x86 Processor Architecture
3. Assembly Language Fundamentals
4. Data Transfers, Addressing and Arithmetic
5. Procedures
6. Conditional Processing
7. Integer Arithmetic
8. Advanced Procedures and Recursion
9. Strings and Arrays
10. Structures and Macros
11. Floating Point and Instruction Encoding
12. High-Level Language Interface with C/C++
13. Interrupts
14. Linux Operating System, Initialization and Process Management

Suggested Text:

Assembly Language for x86 Processors*, 7th Edition.* Kip R. Irvine, Pearson

x86-64 Assembly Language Programming with Ubuntu, Ed Jorgensen, Ph.D. Version 1.1.44

Understanding the Linux Kernel, Daniel P. Bovet and Marco Cesati, Third Edition

Schedule (subject to change):

Week	**Tentative Topic**	**Readings from the textbook**
Week 1	Basic Concepts, Data Representation and Boolean Expressions	Chapter 1
Week 2	x86 Processor Architecture	Chapter 2
Week 3	Assembly Language Fundamentals	Chapter 3
Week 4	Data Transfers, Addressing and Arithmetic	Chapter 4
Week 5	Procedures	Chapter 5
Week 6	*Holiday or Break (Thanksgiving, Study Week)*	
Week 7	Advanced Procedures and Recursion	Chapter 6
Week 8	Strings and Arrays	Chapter 7
Week 9	Structures and Macros	Chapter 8

Week 10	Floating Point and Instruction Encoding	Chapter 12
Week 11	Interrupts and High-Level Language Interface with C/C++	Chapter 13
Week 12	Linux Operating System, Initialization and Process Management	Complementary Reading
Week 13	**Review** **Final day of classes (Monday, December 4, 2023)**	Review

Assignments and Evaluations:

Students taking this course must understand and agree that:

(1) Unless otherwise allowed by the course instructor, Students must complete the assignments in this course without the assistance of anyone else.

(2) Unless otherwise allowed by the course instructor, Students must not access any sources or materials (in print, online, or in any other way) to complete any course exam.

Students must further understand and agree that, if they violate either of these two rules, or if they provide any false or misleading information about their completion of course assignments or exams, they may be prosecuted under the Lakehead University Student Code of Conduct – Academic Integrity, which requires students to act ethically and with integrity in academic matters and to demonstrate behaviours that support the University's academic values.

Group assignments: All team members must demonstrate their contributions towards each item that compose the final mark.

Late Assignments: Late assignments will automatically receive a 0, however they **will be** reviewed to provide formative evaluation feedback and **must be** submitted for course completion.

Grading Scheme:

Item	***% of Final Grade***	***Tentative dates (2023)***
Quizzes 1 - 4	10	Throughout the course (You will be informed 1 week ahead of the quiz)
Assignments 1 - 4	30	Throughout the course
Midterm	30	One week before or after the Study Week.
Final Exam	30	Refer to university's Exam Timetables

Course Policies:

- Behavioral standards to follow: Student Code of Conduct - Academic Integrity

- Attendance and participation in class discussions is highly recommended.
- Students can communicate with the instructor through email using **COMP-2476** - as a **prefix** in the subject line of their message.
- The course outline and schedule are not fixed and subject to change based on class flow.
- You will be taught theoretical computer programming during lecture sessions and will practice programming codes during the lab sessions.
- A passing mark is normally 50% of the total weight of all components.
- There will be no make-up test.
- University's attendance policy is followed.
- There will be 4 assignments. Late assignments will be penalized 20% and will not be accepted after passing a week from the due dates. Assignments and their due dates and time will be posted on MyCourseLink/D2L and announced via emails to all registered students.
- There will be 4 quizzes. These quizzes will be conducted in the lab sessions. Quizzes' date and time will be announced in advance.

Copyright:

Students should be aware that all instructional, reference, and administrative materials prepared for this course are protected in their entirety by copyright. Students are expected to comply with this copyright by only accessing and using the course materials for personal educational use related to the course, and that the materials cannot be shared in any way, without the written authorization of the course instructor. If this copyright is infringed in anyway, students may be prosecuted under the Lakehead University Student Code of Conduct – Academic Integrity, which requires students to act ethically and with integrity in academic matters and to demonstrate behaviours that support the University's academic values.

Regulations:

It is the responsibility of each student registered at Lakehead University to be familiar with, and comply with all the terms, requirements, regulations, policies and conditions in the Lakehead University Academic Calendar. This includes, but is not limited to, Academic Program Requirements, Academic Schedule of Dates, University and Faculty/School Policies and Regulations and the Fees and Refund Policies and Schedules (Lakehead University Regulations webpage, 2023-24).

Academic Integrity:

A breach of Academic Integrity is a serious offence. The principle of Academic Integrity, particularly of doing one's own work, documenting properly (including use of quotation marks, appropriate paraphrasing and referencing/citation), collaborating appropriately, and avoiding misrepresentation, is a core principle in university study. Students should view the Student Code of Conduct - Academic Integrity for a full description of academic offences, procedures when Academic Integrity breaches are suspected and sanctions for breaches of Academic Integrity.

Supports for Students: – there are many resources available to support students. These include but are not limited to:

- Health and Wellness
- Student Success Centre
- Student Accessibility Centre

- Library
- Lakehead International
- Indigenous Initiatives

Lakehead University is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities and/or medical conditions to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a disability and think you may need accommodations, you are strongly encouraged to contact Student Accessibility Services (SAS) and register as early as possible. For more information, please contact Student Accessibility Services (SC0003, 343-8047 or sas@lakeheadu.ca)