



UNIVERSITY OF CALGARY
FACULTY OF SCIENCE
DEPARTMENT OF COMPUTER SCIENCE
COURSE OUTLINE

1. **Course:** CPSC 355: Computing Machinery I

Lecture Sections:

L01, MWF 14:00-14:50, SA 106, Leonard Manzara, ICT 703, 220-3518, manzara@cpsc.ucalgary.ca

L02, MWF 10:00-10:50, AD 140, Leonard Manzara, ICT 703, 220-3518, manzara@cpsc.ucalgary.ca

Office Hours: MWF 11:00-12:00

Course Website: D2L

Computer Science Department Office, ICT 602, 220-6015, cpsc@cpsc.ucalgary.ca

2. **Prerequisites:** One of CPSC 219, 233 or 235

(<http://www.ucalgary.ca/pubs/calendar/current/computer-science.html#3620>)

3. **Grading:** The University policy on grading and related matters is described in sections F.1 and F.2 of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Assignments	30%
Midterm Exam	30%
(Wednesday November 2 nd , 2016 at 18:00 in ENE 241 and 243)	
Final Exam	40%

This course **will** have a Registrar's Scheduled Final Exam.

Special Regulations affecting Final grade: Each of the above components will be given a percentage grade. The final grade will be calculated using the weights given above and then converted to a final letter grade using the table given below. **To achieve an overall grade of C- or better in the course, you must achieve a minimum grade of C- or better in the final exam and complete all assignments.**

4. **Missed Components of Term Work:** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar. Section 3.6. It is the student's responsibility to familiarize themselves with these regulations. See also Section E.6 of the University calendar.
5. **Scheduled Out-of-Class Activities:** REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME ACTIVITY. If you have a clash with this out-of-class activity, please inform your instructor as soon as possible so that alternative assignments can be arranged.
6. **Course Materials:**
Computer Organization & Design, ARM Edition, Patterson & Hennessy, Morgan Kaufmann (Required)
The C Programming Language, Brian Kernighan & Dennis Ritchie, Prentice Hall (Required)

Online Course Components:

None.

7. **Examination Policy:** Closed book. No aids of any kind are permitted. Students should also read the Calendar, Section G, on examinations.
8. **Approved Mandatory and Optional Course Supplemental Fees:** None.
9. **Writing across the Curriculum Statement:** In this course, the quality of the student's writing in the weighted components of the course will be a factor in the evaluation of these components. See also Section E.2 of the University Calendar.

10. **Human Studies Statement:** Students will be expected to participate as subjects or participants in projects. See also Section E.5 of the University Calendar.

11. **OTHER IMPORTANT INFORMATION FOR STUDENTS:**

- a) **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offense that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under Section K, Student Misconduct to inform yourself of definitions, processes and penalties.
- b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on assembly points which can be found in each classroom and building.
- c) **Student Accommodations:** Students needing an Accommodation because of a Disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities available at http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf. Students needing an Accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to the Associate Head of Computer Science.
- d) **Safewalk:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 403-220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also <http://www.ucalgary.ca/secretariat/privacy>
- f) **Student Union Information:** VP Academic (403) 220-3911 suvpaca@ucalgary.ca SU Faculty Rep (403) 220-3913 science1@su.ucalgary.ca, science2@su.ucalgary.ca and science3@su.ucalgary.ca, Student Ombuds Office: (403) 220-6420 ombuds@ucalgary.ca, <http://ucalgary.ca/provost/students/ombuds>
- g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend your cell phone should be turned off unless instructed otherwise. All communications with other individuals via laptop computers, cell phones or other devices connectable to the internet in not allowed during class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.
- h) **U.S.R.I.:** At the University of Calgary feedback provided by students through the Universal Student ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference – please participate in USRI surveys.

Department Approval _____ Date _____

Associate Dean's Approval for
out of regular class-time activity: _____ Date: _____

Associate Dean's Approval for
Alternate final examination
arrangements: _____ Date: _____

A signed copy of this document is kept on file in the Computer Science main Office ICT 602

CPSC 355 Percentage to Letter Grade Conversion Table

A+	95-100
A	90-95
A-	85-90
B+	80-85
B	75-80
B-	70-75
C+	65-70
C	60-65
C-	55-60
D+	50-55
D	45-50
F	0-45

CPSC 355 Syllabus

Introduction

Course Objectives

Computer Architectures and Assembly Language Programming

Basic Computer Architecture
 High-Level Architecture
 CPU
 System Clock
 Random Access Memory
 Bus
 Secondary Memory
 Peripheral Devices
 Basic CPU Architectures
 RISC and CISC Architectures
Instruction Cycle
Assembly Language Programming
Assemblers
Macro Preprocessors

ARMv8-A Architecture

Introduction
General-Purpose Registers
ARMv8 A64 Assembly Language
Basic Program Structure
Basic Arithmetic Instructions
Branch Instructions and Condition Codes
Loops
If and If-Else Constructs
Introduction to the gdb Debugger

Binary Numbers and Integer Representations

Binary Numbers
Unsigned Integers
Signed Integers
Hexadecimal and Octal Numbers
Integer Classes and Subtypes

Bitwise Operations

Bitwise Logical Instructions
Bitwise Shift Instructions
Bitfield Operations
Sign/Zero Extend Operations

Binary Arithmetic

Modulus Arithmetic
Addition
Subtraction
Signed Number Branching Conditions
Unsigned Arithmetic
Unsigned Number Branching Conditions
Multiplication
Division
Extended Precision Arithmetic

The Stack

Memory and Memory Addressing
Stack Memory
The Stack and Frame Pointers
Frames and Frame Records
Creating and Addressing Stack Variables
Memory Alignment

Basic Load and Store Instructions
Load/Store Addressing Modes
Stack Variable Offset Macros

Data Structures

One-Dimensional Arrays
Multidimensional Arrays
Structures
Nested Structures

Subroutines

Introduction
Open (Inline) Subroutines
Closed Subroutines
Subroutine Linkage
Saving and Restoring Registers
Arguments to Subroutines
Pointer Arguments
Returning Integers
Returning Structures
Subroutines with 9 or More Arguments
Optimizing Leaf Subroutines

External Data and Text

Introduction
External Variables
The text, data, and .bss Sections
The ASCII Character Set
Creating and Addressing String Literals
External Arrays of Pointers
Command-Line Arguments

Separate Compilation

Relocatable Object Code
Separate Compilation and Linking

Input and Output

Introduction
System I/O
Standard I/O
File I/O

Floating-Point Numbers

Introduction
Fixed-Point Numbers
Floating-Point Single Format
Floating-Point Double Format
Floating-Point NaNs
Floating-Point Registers
Basic Floating-Point Instructions
Floating-Point Arguments
Floating-Point Return Values

Machine Instructions (as time permits)

Introduction
R-Type Format
D-Type Format
I-Type Format

Learning Outcomes:

By the end of the course: students will:

- By the end of this course, students should be able to create a program that consists of separately compiled source code modules that mix C code and assembly language code.
- By the end of this course, students should be able to take high-level language constructs and translate them into an equivalent assembly language implementation.
- By the end of this course, students should be able to explain the underlying machine representation of common data types such as signed and unsigned integers, characters, strings, and floating point numbers.
- By the end of this course, students should be able to explain the architecture of CPUs in common current use.
- By the end of this course, students should be able to describe the architecture of a basic computer.
- By the end of this course, students should be able to design and implement assembly language programs of moderate complexity.