CPSC1012

Computer Programming Fundamentals

Learning Objectives

- Upon completion of this lesson, you will be able to:
  - Know your instructor's name, contact information, education, and industry experience.
  - Describe the purpose of the course
  - Understand the course grading system.
  - Describe what is a computer program.
  - Understand what a computer program is used for.
  - Describe the tools need to build a computer program.
  - Edit and execute a C# program.
  - Debug a C# program.
  - Define and differentiate syntactic and logic errors.

Class Schedule

- Section A01
  - Monday 10:00am – 11:50am, WB304
  - Wednesday 3:00pm – 4:50pm, WA302
  - Thursday 3:00pm – 4:50pm, WA302

Instructor Info

- Rob Bourbonnais, rbourbonnais@nait.ca, 780.378.5381
- Best way to reach me is using MS Teams chat
- Background information

What to Expect

- Lectures and demos delivered in class.
- Moodle will be used to post assignments and marks
- Class time to do work activities and ask for help. Scheduled appointments can be made for help over and above class time. You should not be sending chat messages to instructors as if they are on-call tutors.

Course Materials

- Course notes, exercises, and labs will be posted on Moodle
- Free "C# Programming Yellow Book" available for download

Course Objectives

In this course, you will learn how to write, test, debug, implement, and maintain computer programs.

Look at the Course Outline on moodle.

Required Learning Resources

- Visual Studio 2022 Community Edition
- Git Client
- Sign up for a Github.com account using your NAIT email address

Student Evaluation

Evaluation	Weight	Passing Criteria
Labs (6 @ 5% each)	30%	>= 50% average
Quizzes (10% Quiz1, 10% Quiz2)	20%	>= 50% average
Assignments (10% Assignment 1, 10% Assignment 2, 10% Assignment 3, 20% Assignment 4)	50%	>= 50% average

Students must pass the assignments, labs, and quizzes with a minimum mark of 50% each. Average mark no less than 50%. If one or more of the components (assignments, labs, quizzes) is not passed then the student receives the lowest component mark as a course grade.

Academic Dishonestly

- Do NOT share any of your files with another student.
- Do NOT use code that you do not understand.
- Both students will receive a mark of zero if academic dishonestly is identified.

What is computer program?

- A sequence of instructions stored in the computer's memory that a computer follows in order to perform a task.
  - A **statement** is a complete instruction that causes the computer to perform some action.

Why Program?

CONCEPT: Computers can do many different jobs because they are programmable

1. To automate a specific task
2. To solve a given computing problem.

Programming is both an art and a science

Common things that must be designed for programs:

- The logical flow of instructions
- The mathematical procedures
- The layout of the programming statements
- The appearance of the screen
- The way information is presented to the user
- The program's "user friendliness"
- Manuals, help systems, and/or other forms of written documentation

Computer Systems: Hardware and Software

CONCEPT: All computer systems consist of similar hardware devices and software components

- Hardware
  - The central processing unit (CPU)
  - Main Memory (Random Access Memory or RAM)
  - Secondary Storage (disk drive, solid state drive)
  - Input Devices
  - Output Devices
- Software
  - Operating Systems
  - Application Software

The Central Processing Unit (CPU)

- The CPU's job is to fetch instructions, follow instructions, and produce some result data
- CPU consists of two parts:
  - Control Unit
  - Arithmetic and Logic Unit (ALU)
- When running a program, the CPU is engaged a process known as the fetch/decode/execute cycle

Programming Languages

CONCEPT: A program is a set of instructions that a computer follows in order to perform a task. A programming language is a special language used to write computer programs.

- C++
- C#
- Java
- JavaScript
- PHP
- Python

What is a Program Made of?

CONCEPT: There are certain elements that are common to all programming languages.

- Key Words (Reserved Words)
- Operators
- Punctuation
- Programmer-Defined Names
- Syntax

What tools do you need to build a computer program?

1. Programming Language
   - A set of keywords and a special syntax for organizing program instructions
2. Source Code Editor
   - For writing and editing code
3. Compiler
   - Translate source code into a form that the computer understands (machine language)
4. Debugger
   - Allows you to step through a program and watch the value of variables change as the program executes

Integrated Development Environment (IDE)

- An Integrated Development Environment (IDE) such as Visual Studio includes all the tools you need to write, build, and run computer programs.
- IDE consists of a text editor, compiler, debugger, and other utilities integrated into a package with a single set of menus

Payroll.cs

```
using System;

public class Payroll
{
  public static void Main(string[] args)
  {
    int hours = 40;
    double grossPay, payRate = 25.0;

    grossPay = hours * payRate;
    Console.WriteLine($"Your gross pay is ${grossPay}");
  }
}
```

Compiling and Running a C# Program

- Run the "Developer Command Prompt for CS 2022" and use the **csc** command to compile a C# source file into a program, for example:

```
csc Payroll.cs
```

- To executable a program type the executable file name, for example:

```
Payroll.exe
```

The Programming Process

CONCEPT: The programming process consists of several steps, which include design, creation, testing, and debugging activities.

1. Understand the problem
2. Clearly define the expected outcome
3. Clearly define all the data
4. Top-down sequence the required tasks
5. Write pseudocode or draw a detailed flowchart (algorithm)
6. Test the logic
7. Write the code

Example (1)

Write a program to calculate the gross pay for an employee by prompting the user to enter their hourly pay rate and the number of hours worked.

1. Clearly defined what the program is to do

Purpose: To calculate the employee's gross pay

Input: Number of hours worked, hourly pay rate

Process: Multiply number of hours worked by hourly pay rate. The result is the employee's gross pay

Output: Display a message indicating the employee's gross pay

Example (2)

2. Visualize the programming running on a computer

```
How many hours did you work? 40
How much do you get paid per hour? 15
Your gross pay is $600.00
```

Example (3)

3. Use design tools to create a model of the program

Display "How many hours did you work!"
Input hours.
Display "How much do you get paid per hour?"
Input rate.
Store the value of hours times rate in the pay variable.
Display the value in the pay variable

Do NOW

- Open Visual Studio 2002 and write a program to display the message “**Eye glasses really help me C#**" to the Console screen.
- From Visual Studio 2022, create another program that displays your Canada Post mailing address to the console screen where the name and address are on separate lines.
- Sign up for a Github.com account using your NAIT email address at https://github.com/
- On your personal computer download and install Visual Studio 2022 Community Edition, Git SCM, and GitHub Desktop.