**Vanier College**

**Faculty of Science and Technologies**

**Computer Science Technology Department**

**Course Title: C++ Programming for Science Teacher Name:** Cornelia Badea Chirita

**Course No.: 420-HTX-05**  **Office:** D 525

**Semester: H-2023 Office hours:**  by appointment

**Sections No.: 00001 Office Phone:** (514) 744 7500 x7470

**Ponderation: 2 (Theory) – 3 (Lab) – 3 (Homework) Email:** use OMNIVOX email

**Pre-requisite: None**

**Schedule: as per Omnivox**

**Course Description**

This course sits in the “additional courses” block of the New Science Program. It introduces science students to computer programming with the most widely used object-oriented programming language, C++. Students will be prepared for using computers and programming in their science courses at CEGEP and then at university. This course will be useful for anyone going on to Engineering, Computer Science and other science programs wherein knowledge of programming would be an asset. Students will not become expert programmers after this course, but will have taken a big step in the right direction.

**Course’s Role in the Program**

C++. Students will be prepared for using computers and programming in their science courses at CEGEP and then at University. This course will be useful for anyone going on to Engineering, Computer Science and other science programs wherein knowledge of programming would be an asset

**Statement of Competencies and Course-Level Learning Outcome**

00UV To apply in structured manner an approach specific to the sciences

**Key Learning Outcomes**

At the end of the course, students will be able to do the following:

* To get comfortable using a computer, Windows, a high-level programming language and an IDE to create, compile and run C++ programs
* To learn many of the basic programming skills and concepts which are common to most current computer languages, including some object-oriented concepts
* To design and write well-structured programs in C++.using objects and functions of both predefined and user-defined classes
* Debug and test programs highlighting logic and structure

**Textbook and Materials**

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| --- | --- |
| **Book Title:**  **ISBN-13:**  **Author:**  **Publisher:**  **Published** | Starting Out with C++ from Control Structures to Objects, 10th edition  9780137450626  Tony Gaddis, Judy Walters & Godfrey Muganda  Pearson  February 14, 2022 |

Amazon.ca, Pearson.com, and other vendors.

Along with the textbook, you will need a USB key (or other storage media) to same your own files.

**Course Content**

**Chapter 1:** Introduction to Computers and Programming

**Chapter 2:** Introduction to C++

**Chapter 3:**  Expressions and Interactivity

**Chapter 4:** Making Decisions

**Chapter 5:** Looping

**Chapter 6:** Functions

**Chapter 7:** Introduction to Classes and Objects

**Chapter 8:** Arrays and Vectors

**Chapter 9:** Searching, Sorting, and Algorithm Analysis

**Chapter 10:** Pointers

**Chapter 11:** More about Classes and Object-Oriented Programming

**Chapter 12:** More on C-Strings and the string Class

Chapter **13**: Advanced File and I/O Operations

Chapter **17**: The Standard Template Library (STL)

**Learning Integration Assessment**

The teacher will give a project description and a plan, with a timeline. Students will individually develop a C++ program integrating the following elements:

* Menu driven user input
* User-defined functions that handle specific tasks
* Use of arrays and vectors
* Use class String in the process of data entry and validation

**LIA Evaluation Criteria**

The following criteria will be considered in the evaluation of the project:

* Functionality of the program
* Correct validation of data inputs
* Correct selection of algorithms for each function
* Clarity of the code and use of proper nomenclature

**Teaching Methods**

Class and lab periods are used to introduce and discuss the concepts and to allow the students to work on the assignments and lab exercises.

**Evaluation Tentatively**

Midterm Exam 20% Week 6

Final Exam 20% Week 13

Assignment 1 10% Week 3

Assignment 2 10% Week 5

Assignment 3 10% Week 8

Assignment 4 10% Week 10

Project 20% Week 15

The exact date of each exam will be announced at least one week in advance.

To pass the course, students must obtain at least 60% on both the weighted average of all course components and the weighted average of the exams. Otherwise, the final mark for the course will be the weighted average of the exams only, irrespective of the grades obtained on the assignments. There will be no makeup exams.

Students will submit their assignments by the due dates. Late assignments will be penalized 10% per day for a maximum of three days. Assignments will not be accepted after three days after the due date.

**Attendance**

Students are expected to attend all scheduled lectures and labs.

Students are responsible for knowing material covered in class and lab, regardless of whether they attend

There are no specific marks given for class attendance or deducted for class absence.

College Policies/ General Academic Policies

It is the student's responsibility to be familiar with and adhere to the Vanier College Academic Policies.

These policies can be found online on the Vanier College website, under Policies.

A summary of course-level policies that apply in this and all other Vanier courses can be found under

“**Course-Level Policies**” in **“Important Vanier Links**” on **Omnivox** or by following this link:

<http://www.vaniercollege.qc.ca/psi/course-level-policies/>

Complete policies can be found on the Vanier College website, under [Policies](http://www.vaniercollege.qc.ca/bylaws-policies-procedures/category/policies/).

**Lab Policy**

Students must adhere to all lab policies. Among other things, consuming food and beverages, talking on cell phones, playing games, video or music, and using illegal software in the labs are not allowed. Lab facilities must be used for academic purposes only and any other use is subject to a fine.

**Professionalism**

Students are expected to conduct themselves in a professional manner during lab and class periods. This includes arriving at their scheduled labs and classes on time and prepared. Students are to remove headphones and to turn off cell phones in labs and classes. Students who are consistently late for class or lab may be refused entry.

**Mediation and Grade Review**

There are two committees available to the student for the resolution of academic complaints:

* The Grades Review Committee to review complaints concerning the grading of a student’s work
* The Faculty Mediation Committee to review academic complaints other than those dealing with student grades

**Weekly Breakdown**

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| --- | --- | --- | --- |
|  | **Lecture** | **Laboratory** | **References** |
| Week 1 | .Introduction to Computers and Programming | Introduction to Visual Studio C++ Environment | Chapter 1 |
|  | Introduction to C++ Program | Program flow | Chapter 2 |
|  |  |  |  |
| Week 2 | Expressions and Interactivity | Data types, arithmetic operators, and expressions; assignment statements, operator precedence, expressions, and mixed expressions | Chapter 3 |
|  | Casting, input statements, output statements | cin << object  cout >> object |  |
|  | Formatting output | setprecision, setw, showpoint, etc |  |
|  | Program style and form | Debugging, understanding and fixing syntax errors | Chapter 3 |
|  |  |  |  |
| Week 3 | Making Decisions | Relational operators: If, if … else  If ..else if | Chapter 4 |
|  | Relational operators | Logical operators: Boolean variables |  |
|  | Boolean expressions | Conditional operator ( ? :) |  |
|  | Switch structure | Switch structure |  |
|  |  | Assignment 1 |  |
|  |  |  |  |
| Week 4 | Introduction to Loops | While loop: counter controlled, sentinel controlled, flag controlled | Chapter 5 |
|  | While loop, for loop, do while loop |  |  |
| Week 5 | Nested loops |  |  |
|  |  | Assignment 2 |  |
|  |  |  |  |
| Week 6 | Exam | Review in the lab | Chapter 2 - 5 |
|  |  |  |  |
|  | Using files for data storage | Writing data to a file, reading data from a file | Chapter 5 |
|  |  |  |  |
| Week 7 | Modular programming | User-defined functions | Chapter 6 |
|  | Scope of an identifier | Global and local variables  Static local variable  Overloading functions |  |
|  |  |  |  |
|  |  |  |  |
| Week 8 | Introduction to classes and objects | Abstract data type  Object oriented programming | Chapter 7 |
|  | Access specifiers | Private and public members |  |
|  | Accessing an object’s members | Accessors and mutators |  |

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| --- | --- | --- | --- |
|  | **Lecture** | **Laboratory** | **References** |
|  | Defining member functions | infline functions  constructors and destructors |  |
|  |  | Performing input and output in a class object |  |
|  |  |  |  |
|  |  |  |  |
|  | Arrays and vectors | Accessing array elements | Chapter 8 |
|  |  | Arrays as function arguments |  |
|  |  |  |  |
|  | Introduction to the STL vector standard library | Defining and initialization of a Vector  Storing and retrieving values in a Vector |  |
|  |  |  |  |
|  | Array of Objects |  |  |
|  |  | Assignment 3 |  |
|  |  |  |  |
| Week 9 | Searching, Sorting, and Algorithm Analysis | Bubble sorting, selection sorting | Chapter 9 |
|  |  |  |  |
| Week 10 | Pointers | Pointers and the address operators | Chapter 10 |
|  |  | Arrays and pointers |  |
|  |  | Pointer arithmetic |  |
|  |  | Pointers as function parameters |  |
|  |  | Dynamic memory allocation |  |
|  |  | Dynamic allocation of class objects |  |
|  |  |  |  |
|  |  | Assignment 4 |  |
|  |  |  |  |
| Week 11 | More about class and object-oriented programming | The this pointer and constant member functions | Chapter 11 |
|  |  | static members  copy constructors  operator overloading |  |
|  |  |  |  |
| Week 12 | More on C-Strings and the string Class | Library functions for working with C-Strings: strcat, strcpy, strcmp | Chapter 12 |
|  |  |  |  |
| Week 13 | Final Exam 2 | Project Assigned – due end of Week 15 |  |
|  |  |  |  |
| Week 14 | Advanced File and I/O Operations | Input and output streams  Member functions for reading and writing files | Chapter 13 |
|  |  |  |  |
| Week 15 | Introduction to the Standard Template Library | Container and iterator fundamentals |  |
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| Week 15 |  | Project Due |  |