**COLLEGE OF THE ROCKIES**

# COMP-110 – Systematic Program Design

## University Arts and Science

**Effective Term & Year:** Fall 2022
**Course Outline Review Date:** 2025-04-01

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**Program Area:** Math and Sciences

**Description:**

This course introduces students to principles of program design and to implementing and understanding computer programs using an object-oriented programming language. Programming topics include selection and iteration, arrays and collections, objects and classes, top-down design and incremental development. The programming skills developed in this course will help students appreciate program design as a tool for information processing, simulation and modelling, and interacting with the world.

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**Program Information:**

This course is an important foundation of many science programs including Physics, Chemistry, Mathematics, Computing Science, and Astronomy.

**Delivery Methods:** On-campus (Face-to-Face)

**Credit Type:** College of the Rockies Credits

**Credits:** 3

**Course type/s:** Sciences

**Instructional Activity and Hours:**

| Activity | Hours |
|---|---|
| Classroom, Directed Studies or Online Instruction | 45 |
| Seminar/Tutorials | |
| Laboratory/Studio | 45 |

| | |
|---|---|
| Practicum/Field Experience | |
| Co-op/Work Experience | |
| Other | |
| Total | 90 |

## Course Requisites:

- Prerequisites: Minimum grade of C+ (65%) in Foundation of Math 10, Workplace Math 10, or equivalent.

**Flexible Assessment:** Yes

In some cases students may be able to apply for recognition of prior learning outside the classroom. This flexible assessment process provides equivalent course credit. It is a rigorous process that may include external evaluation, worksite assessment, demonstration, standardized test, self-assessment, interview, products/portfolio, and challenge exam, or other measures as appropriate. Tuition fees apply. Contact an education advisor for more information.

## Course Transfer Credit:

For information about receiving transfer credit for courses taken at other BC institutions, please see http://www.bctransferguide.ca. All requests for course transfer credit from institutions in BC or elsewhere should go to the College of the Rockies Enrollment Services office.

## Textbook Resources:

Textbook selection varies by instructor and may change from year to year. At the Course Outline Effective Date the following textbooks were in use:

*How to Design Programs, Felleisen, Finder, Flatt, Krishnamurthi, The MIT Press.*

Please see the instructor's syllabus or check COTR's online text calculator *https://textbook.cotr.bc.ca/* for a complete list of the currently required textbooks.

## Learning Outcomes:

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

- apply a systematic design process by writing programs for reasonably complex problems

and following the "one task – one function" rule;
- read function designs and identify different elements;
- evaluate function elements and overall function design;
- write code that is easy to read and interpret by others, as well as being properly organized, documented, and tested;
- demonstrate the relation between information and data by designing data representations for reasonably large and complex problems, and describing the information encoded in that data;
- identify correspondences between data definitions and programs that operate on that data;
- identify how changes to a data definition will affect a program;
- apply abstraction to replace repetitive code from programs they have written, then verify that the new program still solves the original problem;
- write programs that use existing code and libraries to solve new problems;
- identify correspondences between non-code models of a program and the program itself by using non-code models in program design; and
- design, implement, test, and debug programs involving basic computations, conditional and iterative structures, and definition of functions.

## Course Topics:

- Primitive data, expressions, constants, and variables
- Conditional and iterative control structures
- Function definitions and passing of parameters
- Strategies for problem-solving and algorithm design
- Interactive graphical programs.
- Testing and debugging strategies
- Atomic Data, Compound Data, Structures, Self-Reference and Reference Data, Lists, Arrays, Loops, Natural Numbers, Strings, Images, Boolean Expressions, Helper Functions. Binary Search Trees, Mutual Reference, Local Expressions and Local Functions, Abstract Functions, Recursion, Searching, Accumulators, Graphs, Mutation

*See instructor's syllabus for the detailed outline of weekly readings, activities and assignments.*

# Evaluation and Assessments

## Assessment Type: On-Campus (face-to-face)

| Assessment Type | % of Total Grade |
|---|---|
| Assignments | 15% |
| Labs | 10% |
| Quizzes and in-class activities | 15% |
| Midterm Exams | 35% |

| Final Exam | 25% |
|---|---|
| Total | 100% |

## Grade Scheme

| A+ | A | A- | B+ | B | B- | C+ | C | C- | D | F |
|---|---|---|---|---|---|---|---|---|---|---|
| >=90 | 89-85 | 84-80 | 79-76 | 75-72 | 71-68 | 67-64 | 63-60 | 59-55 | 54-50 | <50 |

**Pass requirements:** A passing mark (50% or higher) on the midterms and final exam and a 60% average on the lab component.

**Evaluation Notes:** A grade of "D" grants credit, but may not be sufficient as a prerequisite for sequential courses.

**Exam Attendance:**

Students must attend all scheduled exams at the appointed time and place. Instructors may approve an alternate exam to accommodate an illness or personal crisis. Department heads will consider other written requests. Any student who misses a scheduled exam without prior approval will receive a "0" on the exam.

**Academic Policies:**

College of the Rockies policies related to courses can be found at https://cotr.bc.ca/about-us/college-policies/ and include the following:

- Policy 2.4.3 Students with Documented Disabilities
- Policy 2.4.4 Student Conduct (plagiarism, other cheating, behavioral misconduct)
- Policy 2.5.8 Academic Performance
- Policy 2.5.3 Grade Appeal
- Policy 2.4.9 Student Concerns Re Faculty

**Course Changes:**

The College of the Rockies updates course outlines regularly to meet changing educational, employment and marketing needs. The instructor will notify students in writing of any updates to this outline during the semester. The instructor reserves the right to revise, add or delete material while meeting the learning outcomes of this course outline.