



ENGG*1420 Object-Oriented Programming for Engineers

01

Winter 2024

Section(s): C01

School of Engineering

Credit Weight: 0.50

Version 2.00 - January 09, 2024

1 Course Details

1.1 Calendar Description

This course introduces the Object Oriented (OO) approach to software from an engineering perspective. It culminates in a substantial team-based software development project. Topics include defining classes and objects, inheritance, overloading, polymorphism, data encapsulation, interfaces, files and streams, exception handling, dynamic memory, and namespaces.

Pre-Requisites: ENGG*1410

Restrictions: Non-BENG students may take a maximum of 4.00 ENGG credits.

1.2 Course Description

This course introduces the Object-Oriented (OO) approach to software_engineering including design, development, and testing. It culminates in a substantial team-based software development project. Main topics include defining classes and objects, inheritance, polymorphism, interfaces, exception handling, and files.

1.3 Timetable

Lectures:

- M/W/F 10:30 AM - 11:20 AM, ROZH 102

Laboratory:

- W 1:30 PM - 3:20 PM: HRN 2313
- Th 2:30 PM - 4:20 PM: THRN 2313
- Th 8:30 AM - 10:20 AM: THRN 1319
- T 1:30 PM - 3:20 PM: THRN 2313

Tutorials:

- T 11:30 AM - 12:20 PM: THRN 1313
- F 9:30 AM - 10:20 AM: THRN 1313
- T 8:30 AM - 9:20 AM): THRN 1313
- M 1:30 PM - 2:20 PM: THRN 1313

1.4 Final Exam

Tuesday, April 16, 2024 (8:30 AM - 10:30 AM), Room TBA on WebAdvisor

2 Instructional Support**2.1 Instructional Support Team**

Instructor:	Fattane Zarrinkalam
Email:	fzarrink@uoguelph.ca
Telephone:	+1-519-824-4120 x56907
Office:	THRN-2405
Office Hours:	Thursday 9:00 AM -10:30 AM or by email

2.2 Teaching Assistants

Teaching Assistant (GTA):	Hadiseh Moradisani
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Teaching Assistant (GTA):	Parya Abadeh
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3 Learning Resources

3.1 Required Resources

Course Website (Website)

<http://courselink.uoguelph.ca>

Course material, news, announcements, and grades will be regularly posted to the ENGG*1420 CourseLink site. You are responsible for checking the site regularly.

Required Resources (Textbook)

There is no required textbook for the course.

3.2 Recommended Resources

Recommended Resources (Textbook)

Deitel et al. Java How to Program (Early Objects), 11th Edition, 2018, ISBN 9780134743356

Bruce Eckel, Thinking in Java, 2006, ISBN 9780131872486

Deitel et al. C++ How to Program, 10th Edition, 2016, ISBN 9780134448237

3.3 Additional Resources

Lecture material (Notes)

All of the lecture notes will be posted on the course website as the term progresses.

Lab Information (Lab Manual)

The handouts for all the lab sessions will be posted on the course website.

Assignments (Notes)

All types of resources regarding tutorials will be posted on the course web site.

Miscellaneous Information (Other)

Other information related to this course will be posted on the course website.

4 Learning Outcomes

This course is secondary course in programming for engineers. It serves as an introduction to object-oriented programming methodology. Over the course of the term, students will apply object-oriented principles to the design and implementation of a software system, using

modern engineering tools.

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Design a software solution to a real engineering problem using the Object-Oriented (OO) approach.
2. Write a program in Java to implement a proposed design.
3. Apply fundamental OO techniques: Inheritance, Overriding, Polymorphism.
4. Apply appropriate Data Encapsulation practices.
5. Apply advanced Java concepts: Exception handling and Interfaces.
6. Write a program in C++ to implement a proposed design.
7. Teamwork

4.2 Engineers Canada - Graduate Attributes (2018)

Successfully completing this course will contribute to the following:

#	Outcome	Learning Outcome
1	Knowledge Base	1, 2, 3, 4, 5
1.1	Recall, describe and apply fundamental mathematical principles and concepts	1, 2, 3, 4, 5
1.2	Recall, describe and apply fundamental principles and concepts in natural science	1, 2, 3, 4, 5
1.3	Recall, describe and apply fundamental engineering principles and concepts	1, 2, 3, 4, 5
1.4	Recall, describe and apply program-specific engineering principles and concepts	1, 2, 3, 4, 5
2	Problem Analysis	2, 5
2.1	Formulate a problem statement in engineering and non-engineering terminology	2, 5

#	Outcome	Learning Outcome
2.2	Identify, organize and justify appropriate information, including assumptions	2, 5
2.3	Construct a conceptual framework and select an appropriate solution approach	2, 5
2.4	Execute an engineering solution	2, 5
2.5	Critique and appraise solution approach and results	2, 5
4	Design	1, 4, 5, 6
4.1	Describe design process used to develop design solution	1, 4, 5, 6
4.2	Construct design-specific problem statements including the definition of criteria and constraints	1, 4, 5, 6
4.3	Create a variety of engineering design solutions	1, 4, 5, 6
4.4	Evaluate alternative design solutions based on problem definition	1, 4, 5, 6
4.5	Develop and refine an engineering design solution, through techniques such as iteration, simulation and/or prototyping	1, 4, 5, 6
5	Use of Engineering Tools	2, 6
5.1	Select appropriate engineering tools from various alternatives	2, 6
5.2	Demonstrate proficiency in the application of selected engineering tools	2, 6
5.3	Recognize limitations of selected engineering tools	2, 6
6	Individual & Teamwork	1, 3, 4, 5, 7
6.1	Describe principles of team dynamics and leadership	1, 3, 4, 5, 7
6.2	Understand all members' roles and responsibilities within a team	1, 3, 4, 5, 7
6.3	Execute and adapt individual role to promote team success through, for example, timeliness, respect, positive attitude	1, 3, 4, 5, 7
6.4	Apply strategies to mitigate and/or resolve conflicts	1, 3, 4, 5, 7
6.5	Demonstrate leadership through, for example, influencing team vision and process, promoting a positive team culture, and inspiring team members to excel	1, 3, 4, 5, 7
7	Communication Skills	7

#	Outcome	Learning Outcome
7.1	Identify key message(s) and intended audience in verbal or written communication as both sender and receiver	7
7.2	Interpret technical documentation such as device specification sheets, drawings, diagrams, flowcharts, and pseudocode	7
7.3	Construct the finished elements using accepted norms in English, graphical standards, and engineering conventions, as appropriate for the message and audience	7
7.4	Substantiate claims by building evidence-based arguments and integrating effective figures, tables, equations, and/or references	7
9	Impact of Engineering on Society and the Environment	3
9.3	Anticipate the positive and negative impacts of introducing innovative technologies to solve engineering problems	3
12	Life Long Learning	2
12.1	Identify personal career goals and opportunities for professional development	2
12.2	Self-assess skills relative to career goals and SOE defined learning outcomes	2
12.3	Demonstrate capability for continuous knowledge and skill development in a changing world	2

5 Teaching and Learning Activities

5.1 Lecture

Lecture 1

Topics: Orientation and Introduction to Java programming

Learning Outcome: 1, 2

Lectures 2 - 3

Topics: Introduction to Object-Oriented programming

Learning Outcome: 1

Lectures 4 - 5

Topics: Basics of Java

Learning Outcome: 2

Lectures 6 - 7

Topics: Access Controls: package, import, access modifiers

Learning Outcome: 2, 4

Lecture 8

Topics: Constructors

Learning Outcome: 1, 4

Lectures 9

Topics: Strings

Learning Outcome: 2

Lectures 10 - 11

Topics: Arrays and ArrayList

Learning Outcome: 2

Lecture 12

Topics: Parameter Passing

Learning Outcome: 2

Lectures 13

Topics: Static Class Members

Learning Outcome: 2

Lecture 14

Topics: Final Instance Variables

Learning Outcome: 1, 2

Lectures 15 - 17

Topics: Inheritance and Method Overriding

Learning Outcome: 3

Lectures 18 - 20

Topics: Polymorphism

Learning Outcome: 3

Lecture 21

Topics: Interface

Learning Outcome: 5

Lectures 22 - 23

Topics: Exception Handling

Learning Outcome: 5

Lectures 24 - 26

Topics: Files and Streams

Learning Outcome: 2, 5

Lectures 27 - 28

Topics: Introduction to C++

Learning Outcome: 6

Lectures 29 - 30

Topics: Object Oriented Programming in C++

Learning Outcome: 1, 3, 6

5.2 Lab

Week 2

Topics: L1 - Unix Refresher and Pointers Refresher

Week 3

Topics: L2: Compiling and Executing Basic Java Programs

Week 4

Topics: L3: Introduction to Git and working with Remote Repositories

Week 5

Topics: L4: Debugging

Week 6

Topics: L5: Graphical User Interface (GUI) in Java

Week 7

Topics: Winter Break

Week 8

Topics: L6: Code Optimization and Profiling

Week 9

Topics: Project Delivery (Phase 1)

Week 10

Topics: L7: Testing Using Junit

Week 11

Topics: Project Delivery (Phase 2)

Week 12

Topics: L8: Debugging and Testing C++ codes

Week 13

Topics: Project Delivery (Phase 3)

5.3 Important Dates (Undergraduate Calendar)

- Monday, January 8, 2024: First day of classes
- Friday, February 16, 2024: Winter Break begins at end of classes this day
- Monday, February 26, 2024: Winter Break ends and classes resume
- Friday, April 5, 2024: Last day for regularly scheduled classes

For more details please check 2023-2024 Academic Calendar
(<https://calendar.uoguelph.ca/undergraduate-calendar/schedule-dates/winter-semester/>)

6 Assessments

6.1 Assessment Details

Quizzes (from assignments) (20%)

Learning Outcome: 1, 2, 3, 4, 5, 6

Assignments and Quizzes (individual):

Assign 1. Warm-up assignment in C & C++

Assign 2. Basic Structures in Java

Assign 3. Classes and Objects in Java

Assign 4: Constructors and Access Modifiers

Assign 5. Strings and Arrays

Assign 6. Inheritance and Polymorphism

Assign 7. Interfaces

Assign 8. Files

Assign 9 and 10. Object Oriented Programming in C++

Each assignment will be distributed to students following the corresponding lectures, with a **one-week gap** before the due date. They are not mandatory but are **for you to practice**. They are **not graded**.

The **quiz related to each assignment** will be held during the **tutorial session**, scheduled after the assignment's due date. The quiz question will be similar to its corresponding assignment.

Each quiz makes an equal contribution to the overall points for quizzes.

Midterm 1 (5%)

Date: Fri, Feb 2, 10:30 AM - 11:20 AM, MCKN 117

Learning Outcome: 1, 2

The test will assess all content presented in the lectures up to the current date.

Midterm 2 (5%)

Date: Wed, Feb 28, 10:30 AM - 11:20 AM, MCKN 117

Learning Outcome: 1, 2, 3, 4

The test will assess all content presented in the lectures up to the current date.

Midterm 3 (5%)

Date: Mon, Mar 25, 10:30 AM - 11:20 AM, MCKN 117

Learning Outcome: 1, 3, 6

The test will assess all content presented in the lectures up to the current date.

Final Exam (30%)

Date: Tue, Apr 16, 8:30 AM - 10:30 AM, TBA

Learning Outcome: 1, 2, 3, 4, 5, 6

Final Project (20%)

Date: Week 13

Learning Outcome: 1, 2, 3, 4, 5, 6, 7

Final Project (teams of 5-6 students): The project will involve designing and implementing a software solution to a project that its description will be uploaded via CourseLink. The project should apply Object-Oriented design principles as covered in lectures and assignments. The labs will introduce various software-based engineering tools that will help complete the project. The project will be delivered in 3 phases.

Lab Assessment (15%)

Learning Outcome: 2, 6

Your performance will be assessed according to the execution of lab exercises throughout each lab session.

L1 - Unix Refresher and Pointers Refresher (10%)

L2: Compiling and Executing Basic Java Programs (10%)

L3: Introduction to Git and working with Remote Repositories (10%)

L4: Debugging (10%)

L5: Graphical User Interface (GUI) in Java (10%)

L6: Code Optimization and Profiling (10%)

L7: Testing Using Junit (20%)

L8: Debugging and Testing C++ codes (20%)

7 Course Statements

7.1 Passing Grade

The passing grade is 50%.

7.2 Missed Assessment

If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email the course instructor. See the undergraduate calendar for information on regulations and procedures for Academic Consideration: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

7.3 Lab Work

You must attend and complete all laboratories. If you miss a laboratory due to any reason, arrangements must be made with the teaching assistant to complete a make-up lab.

7.4 Questions Concerning Grades

All requests for re-marking must be made to the person who marked the quiz or test. Any item that is re-marked will be re-marked entirely. Therefore, it is strongly suggested that you thoroughly review your entire document before making a remarking request. Pencil-written works will not be re-marked. Re-marking requests will not be honoured more than one week after the document has been returned to the students in the first place.

7.5 Academic Consideration

If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email the course instructor. See the undergraduate calendar for information on regulations and procedures for Academic Consideration: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08ac.shtml>

7.6 Accommodation of Religious Obligations

If you are unable to meet an in-course requirement due to religious obligations, please email

the course instructor within two weeks of the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Consideration of Religious Obligations: <http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08accomrelig.shtml>

8 School of Engineering Statements

8.1 Instructor's Role and Responsibility to Students

The instructor's role is to develop and deliver course material in ways that facilitate learning for a variety of students. Selected lecture notes will be made available to students on Courselink but these are not intended to be stand-alone course notes. Some written lecture notes will be presented only in class. During lectures, the instructor will expand and explain the content of notes and provide example problems that supplement posted notes. Scheduled classes will be the principal venue to provide information and feedback for tests and labs.

8.2 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and lab sessions. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who do (or may) fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

8.3 Lab Safety

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. As a student in a lab course you are responsible for taking all reasonable safety precautions and following the lab safety rules specific to the lab you are working in. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

9 University Statements

9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or

compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Graduate Calendar - Grounds for Academic Consideration

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions

<https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml>

9.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Graduate Calendar - Registration Changes

<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml>

Associate Diploma Calendar - Dropping Courses

<https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml>

9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to make a booking at least 14 days in advance, and no later than November 1 (fall), March 1 (winter) or July 1 (summer). Similarly, new or changed accommodations for online quizzes, tests and exams must be approved at least a week ahead of time.

For Guelph students, information can be found on the SAS website
<https://www.uoguelph.ca/sas>

For Ridgetown students, information can be found on the Ridgetown SAS website
<https://www.ridgetownc.com/services/accessibilityservices.cfm>

9.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community-faculty, staff, and students-to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct
<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Graduate Calendar - Academic Misconduct
<https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml>

9.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

9.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars
<https://www.uoguelph.ca/academics/calendars>

9.9 Illness

Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g.. final exam or major assignment).
