Western Science

Department of Computer Science

Course Outline

CS3307B - Objected-Oriented Design and Analysis

Section 001

FW25 - Winter 2026

1. Course Information

Course Description
Software development comprises many activities (e.g., technical, managerial, governance, customer relations, market analysis, etc.) among which are those that take requirements as input, and yield, as output, software code that is intended to satisfy the requirements. In this development process is a key artefact, the *design of the system*, that embodies the various components of the system interacting with each other to provide the desired solution. Prior to, or even during, designing the system is the *analysis* of the environment in which the system is to operate, including discovering the system's requirements. Arguably, without these two sets of activities – analysis and design – in the development process, it would be difficult to build large-scale, quality systems.

The most widely used approach to system design and requirements analysis nowadays is the object-oriented approach. Here, the Unified Modeling Language (UML) notation is used to capture the user interaction with the system being built, and how the system will be structured, and how it will interact within to provide the desired outcomes. Over the years, the software engineering community has identified many useful patterns of how system components are structured and how they interact with one another. Thus, the developer can attempt to reuse these patterns as partial solutions in the design of new systems, saving design time and costs and attaining higher quality. These design patterns can be implemented using object-oriented (OO) programming languages such as Java and C++.

In this course, students will learn about object-oriented analysis and design and will be introduced to the programming language C++. They will subsequently carry out specific assignments, and a group project where they are expected to design and implement a reasonably large-scale system in the language C++.

Prerequisite(s):
Either (Computer Science 2212A/B/Y) or (Computer Science 2210A/B, 2211A/B, Electrical and Computer Engineering 3375A/B, and registration in the fourth year of a BESc program in Computer Engineering or Mechatronic Systems Engineering.)

Antirequisite(s):
Software Engineering 3350A/B if taken before the 2022-2023 academic year.

Unless you have either the prerequisites for this course or written special permission from the Department of Computer Science to enroll in it, you may be removed and withdrawn from this course in accordance with university policy. This may be done after the add/drop deadline of the academic term, and the course will be marked as withdrawn (WDN) on your academic record. This decision may not be appealed.

2. Instructor Information

Instructor	Section	Email	Consulting
Mike Katchabaw	001	katchab@csd.uwo.ca	Thursdays 11:00am - 1:00pm via Zoom

We generally try to respond to e-mails in two business days (non-holiday weekdays). It is important to start working on assignments early, such that we have enough time to respond to your questions before the due date.

Students must use their Western (@uwo.ca) email addresses when contacting their instructors or TAs. We will be unable to respond to e-mails sent from other email providers for privacy reasons. Include the course code (CS3307) in the subject line of emails to avoid your emails being sent to our spam folder. Please also note that source code files may be blocked by Western's e-mail server. If you need to send a code file to your instructor or TA, please first place it in a .zip archive or rename the file extension to .txt.

3. Class Schedule, Delivery Mode, and Technology Requirements

Class Schedule

Section	Tuesday	Thursday
001 Mike Katchabaw	9:30 AM to 11:30 AM [redacted]	9:30 AM to 10:30 AM [redacted]

Delivery Mode

This class is delivered through in-person lecturing. Although the intent is for this course to be delivered in person, should any university-declared emergency require some or all of the course to be delivered online, either synchronously or asynchronously, the course will adapt accordingly. The grading scheme will not change. Any assessments affected will be conducted online as determined by the course instructor.

Technology Requirements

To participate fully in this course, you will require access to a computer capable of running a decently recent Unix-like environment as well as development tools to edit, build, and run C++ project code. Generally, the software required for this is freely available for Windows, MacOS, and Linux.

You will also need a web browser and reliable internet connection capable of accessing the course OWL site for lecture materials, assignments, and other content. In addition, you will also use web-based project and code management tools to complete project milestones. You will be required to agree to accept the terms of use and privacy agreements for all required software and services to take this course.

Each student will have access to computing facilities administered by the Department of Computer Science and/or Western University. In accepting their accounts, students agree to abide by the Department's Rules of Ethical Conduct. During this course, we may also make use of cloud infrastructure provided either by Western or by Amazon; details on this will be discussed in class.

Note: *After-hours access to Computer Science lab rooms is by your Western ONECard. If your student card is lost, you will need to visit the Student Services Building to obtain a replacement. As of 2025, the cost for a replacement card is $50. More information is available at https://registrar.uwo.ca/services/western_onecard_and_photo_standards.html. Students enrolled in Computer Science courses will be granted access to the labs within 7 days of enrolment. If you do not have access to the labs after 7 days, please open a ticket with Science Technology Services at https://helpdesk.sci.uwo.ca.*

Tentative Topics

The course will address as many of the following topics as time will allow:

- Overview of Object-Oriented programming
- Programming in C++
- The Unified Modeling Language (functional, structural, and behavioural modelling)
- Architectural patterns
- Design patterns (creational, structural, behavioural, ...)
- Object-Oriented metrics and other software metrics
- Quality Assurance (inspections)
- Enterprise-scale software and collaboration tools (Git, GitLab, ...)

Key Sessional Dates

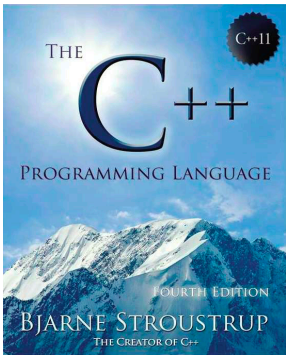
Classes Begin: January 5, 2026
Spring Reading Week: February 14 – 22, 2026
Classes End: April 9, 2026
Exam Period*: April 12 – 30, 2026

** You must be available during the exam period. Planning travel during these dates will not be grounds for a special (makeup) exam.*

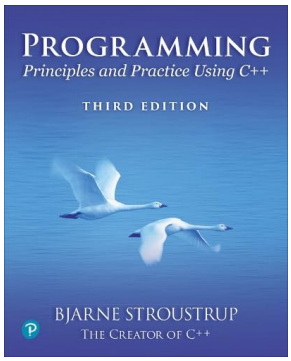
4. Course Materials

Recommended Textbooks

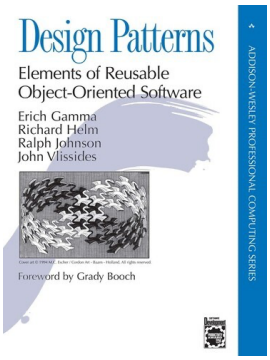
There are no required books for the course, but several are recommended; these texts may be available for purchase from the University Bookstore or other sources, such as the Used Book Store:



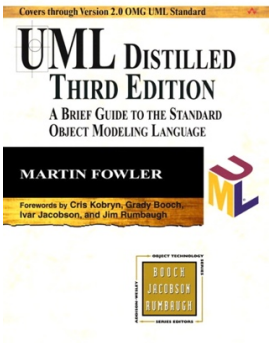
Title: The C++ Programming Language, 4th Edition
Authors: Bjarne Stroustrup
Publisher: Addison-Wesley Professional, 2013
Bookstore Link: TBA



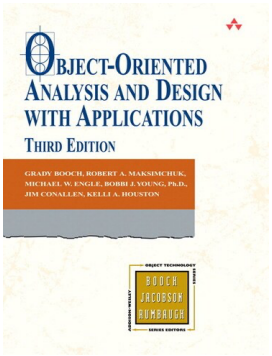
Title: Programming Principles and Practice Using C++, 3rd Edition
Authors: Bjarne Stroustrup
Publisher: Addison-Wesley Professional, 2024
Bookstore Link: TBA



Title: Design Patterns: Elements of Reusable Object-Oriented Software
Authors: Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides
Publisher: Addison-Wesley Professional, 1995
Bookstore Link: TBA



Title: UML Distilled: A Brief Guide to the Standard Object Modeling Language, Third Edition
Author: Martin Fowler
Publisher: Addison-Wesley Professional, 2004
Bookstore Link: https://bookstore.uwo.ca/product/0321193687



Title: Object-Oriented Analysis and Design with Applications, Third Edition
Authors: Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young Ph.D., Jim Conallen, Kelli A. Houston
Publisher: Addison-Wesley Professional, 2007
Bookstore Link: TBA

OWL Course Site
Course material will be posted to OWL: https://westernu.brightspace.com

Students are responsible for checking the course OWL site (https://westernu.brightspace.com) and their Western email regularly for news and updates (at ***least*** once a week). This is the primary method by which information will be disseminated to all students in the class.

If students need assistance with the course OWL site, they can seek support on the OWL Brightspace Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Lecture Notes
Course lecture notes will be made available in PDF format on the course website on a weekly basis, as they are developed. They are provided as a courtesy by the course instructor. Possessing (and even reading) these notes is not a suitable substitute for attending lectures.

5. Methods of Evaluation

Grading Scheme and Assessment Dates

The overall course grade will be calculated as listed below:

Course Element	Weight	Notes
Assignment and Project Work	70%	See Assignment and Project Work section below for breakdown
Final Exam	30%	Scheduled by the university

To be eligible to receive a grade of 50% or higher (i.e. to pass the course), you must achieve:

- At least 40% weighted average on the final exam
- At least 40% weighted average on assignment and project work

If you fail to meet **either** of these conditions, your final mark will be either 45% or your calculated grade, whichever is lower.

To be eligible to receive a grade of 60% or higher, you must achieve:

- At least 50% weighted average on the final exam
- At least 50% weighted average on assignment and project work

If you fail to meet **either** of these conditions, your final mark will be either 58% or your calculated grade, whichever is lower.

5.1. Assignment and Project Work

Assigned course work will take the form of an individual assignment and a group project divided into several components due throughout the term. The individual assignment will provide an introduction to C++ and give technical background to support the group project, and group project components will take this experience and leverage it towards the design and implementation of a reasonably large-scale software system, also using C++. Assignment and project component descriptions will be posted on the course OWL site at least two weeks prior to their official due dates; any changes, updates, and clarifications to these descriptions will also be posted on OWL. Unless noted in the descriptions otherwise, assignment and project work will be due by 11:55pm on their due date.

A **tentative** *(subject to change)* schedule of assignment and project components is given below *(see the OWL course site for official due dates and assignment descriptions)*.

Assignment	Tentative Due Date	Weight *(of your final grade)*	Tentative Topics
Individual Assignment	February 3, 2026	15%	C++ programming; use of tools, SDKs, and APIs of relevance to the project
Group Project: Stage #1	January 27, 2026	5%	Project proposal including an outline of requirements and risks
Group Project: Stage #2	February 10, 2026	10%	User stories and initial software design for the project
Group Project: Stage #3	March 10, 2026	10%	Design refinement and initial project prototyping and implementation
Group Project: Final Project Submission	April 2, 2026	25%	Final implementation and integration of the project; acceptance testing
Group Project: Postmortem / Peer Review	April 9, 2026	5%	Reflective analysis of what went well, what did not, and how things could be improved

If, for any reason, the schedule given above cannot be adhered to, the project marks will be pro-rated. (The assignment and project components are worth 70% of the overall mark for the course. If a component is cancelled for any reason, the remaining assignment and project component weights will be prorated to add up to 70%.)

Note: While the project is a group project, grades will be assigned to each student based on both group and individual performance for each component. Individual performance will be based on a number of factors, some of which may include peer evaluations, contributions made during meetings, repository logs and metrics, individual reports of work completed, and so on. Students who do not adequately participate in the group project could easily fail the course given that the project is also worth the majority of grades earnable in the course.

Late Policy

It is expected that students budget enough time to properly submit their assignments via OWL and allow for any unforeseen technological issues. For group work, time should also be budgeted to integrate your group's work together for a single cohesive submission. Students are expected to regularly backup their assignments and submit well before any deadline.

Late assignment and project components will be accepted for up to two days after the due date, with weekends counting as a single day; the late penalty is 20% of the available marks per day. Lateness is based on the time the assignment or project component is submitted.

Extensions will be granted only by your course instructor. If you have serious medical or compassionate grounds for an extension, you must take supporting documentation to the Academic Counselling unit of your faculty, who will contact the instructor.

Rules and Policies for Assignments and Projects

The following rules and polices apply to all project components:

1. **Submission:**
    a. All components must be type-written for legibility and to facilitate electronic submission. If components require the creation of diagrams or illustrations, these too must be done electronically. Appropriate tools will be discussed in class and in the descriptions of the components.
    b. You are required to submit each component electronically through the course OWL site. (If final submissions are too large for OWL submission, alternate arrangements will be made.) Details will be given in the descriptions. We reserve the right to use similarity detection software to detect possible plagiarism cases.
    c. Components are expected to be individual efforts (where individual could also mean designated group in the case of a group project component). Any code that is borrowed from an existing source or book must be clearly identified as such in the appropriate documentation; otherwise, this may constitute a plagiarism offence.

2. **Marking:**
    a. Assignment and project components are marked by the instructor and/or a teaching assistant assigned to the course. We will attempt to include some information about the marking criteria in the appropriate descriptions.
    b. When marking has been completed, you will be informed via the course website and/or e-mail.
    c. A request for adjustment in a mark must be made within 2 weeks of the date on which it was first available for pickup. (Beyond that date, regrading will not be considered.) Such a request must be submitted in writing and must include specific reasons why you believe you deserve more marks. The request must be accompanied by all materials that were originally handed in, as well as the original marker's grade summary sheet. Regrading requests will take a minimum of 24 to 48 hours to process; you will be informed when it is complete.
    d. Component marks may be posted periodically throughout the term through OWL. It is your responsibility to check that your marks have been recorded correctly.

3. **Academic Integrity:**

    a. **Assignments are to be done individually or in groups working independently without the aid of others** (including tutors or using code from online and other sources)**.** Submitted code will be run through a similarity-checking software. Any students or student groups with significantly high similarity will be referred to the department's integrity committee and will receive a zero grade (the integrity committee may apply additional penalties). **Do not copy or share code in any way.**

    b. **You may <u>not</u> use generative AI or tools capable of generating code for assignments.** Use of these tools on assignments (even for small portions of code or comments) will result in a zero grade and referral to the department's integrity committee.

    c. **You may not use code you have previously written from past courses or past terms** without written permission from the course instructor.

    d. **You may not share or otherwise publish your code online (e.g. to GitHub) publicly** until one month after the course has completed.

5.2. Final Exam

The final exam will be scheduled by the University. The exam period is from April 12th to 30th 2026 and the exact date, time, and location for our exam will likely be announced in March. **The final exam is cumulative, closed book, and is 3 hours in length.**

You must be available during the final exam period. No special (make up) exam will be offered if you are absent due to avoidable travel conflicts.

6. Accommodations and Missed Coursework

General Information About Missed Coursework

Students must familiarize themselves with the *University Policy on Academic Consideration – Undergraduate Students in First Entry Programs* posted on the Academic Calendar: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf

This policy does not apply to requests for Academic Consideration submitted for **attempted or completed work**, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult Accessible Education.

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage:
https://registrar.uwo.ca/academics/academic_considerations/
All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request without supporting documentation in this course. However, the following assessments are excluded from this, and therefore always require formal supporting documentation:

- The examination, which is scheduled during the official examination period defined and regulated by policy.
- All course assessments designated to be part of the group project, which must also be regulated closely to ensure that the actions and circumstances of one student have as little impact on other students in their group as possible. (A group project with multiple milestones due on different dates is considered as one assessment for the purposes of always requiring documentation for academic consideration.)

This means that the only assessment in the course for which students can make an Academic Consideration request without supporting documentation is the Individual Assignment. This assessment, being the sole individual assignment in the course, is considered to be an essential learning requirement for the course. As such, the remedy for Academic Consideration in this case will be to provide an extension to its submission, waiving the late penalty for the assessment as necessary.

7. Additional Statements

7.1. Religious Accommodation

When conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing to the course instructor and/or the Academic Advising office of their Faculty of Registration. This notice should be made as early as possible but not later than two weeks prior to the writing or the examination (or one week prior to the writing of the test).

Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays:

https://www.edi.uwo.ca.

7.2. Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic Accommodation_disabilities.pdf

7.3. Academic Policies

The website for Registrar Services is https://www.registrar.uwo.ca/.

In accordance with policy,

https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf

the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

No calculators, phones, smart watches, headphones, or other electronic devices will be permitted during the final exam. No phones or other electronic devices may be on your person while writing the final exam.

The final exam is closed book. No notes, texts, or other resources are allowed.

7.4. Requests for Relief

(Formally known as "appeals")

Policy on Request for Relief from Academic Decision:
https://uwo.ca/univsec//pdf/academic_policies/appeals/requests_for_relief_from_academic_decisions.pdf

Procedures on Request for Relief from Academic Decision (Undergraduate):
https://uwo.ca/univsec//pdf/academic_policies/appeals/undergrad_requests_for_relief_procedure.pdf

7.5. Scholastic Offences

Policy on Scholastic Offences:
https://uwo.ca/univsec//pdf/academic_policies/appeals/scholastic_offences.pdf

Procedures on Scholastic Offences (Undergraduate):
https://uwo.ca/univsec//pdf/academic_policies/appeals/undergrad_scholastic_offence_procedure.pdf

7.6. Use of Electronic Devices During Assessments

In courses offered by the Faculty of Science, the possession of unauthorized electronic devices during any in-person assessment (such as tests, midterms, and final examinations) is strictly prohibited. This includes, but is not limited to: mobile phones, smart watches, smart glasses, and wireless earbuds or headphones.

Unless explicitly stated otherwise in advance by the instructor, the presence of any such device at your desk, on your person, or within reach during an assessment will be treated as a *scholastic offence*, even if the device is not in use.

Only devices expressly permitted by the instructor (e.g., non-programmable calculators) may be brought into the assessment room. It is your responsibility to review and comply with these expectations.

7.7. Use of Generative AI Tools

Unless otherwise stated, the use of generative AI tools (e.g., ChatGPT, Microsoft Copilot, Google Gemini, or similar platforms) is **not permitted** in the completion of any course assessments, including but not limited to: assignments, lab reports, presentations, tests, and final examinations.

Using such tools for content generation, code writing, problem solving, translation, or summarization—when not explicitly allowed—will be treated as a **scholastic offence**.

If the use of generative AI is permitted for a particular assessment, the conditions of use will be specified by the instructor in advance. If no such permission is granted, students must assume that use is prohibited. It is your responsibility to seek clarification before using any AI tools in academic work.

All required papers and assignments may be subject to submission for textual, metadata, and code similarity review using commercial plagiarism detection software under license to the University for the detection of plagiarism (i.e. Gradescope and/or Measure Of Software Similarity (MOSS)). Use of the services is subject to the licensing agreements currently between The University of Western Ontario and the respective services.

7.8. Support Services

Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic-related matters: https://www.uwo.ca/sci/counselling/.

Students who are in emotional/mental distress should refer to Mental Health@Western (https://uwo.ca/health/) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

https://www.uwo.ca/health/student_support/survivor_support/get-help.html

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at

http://academicsupport.uwo.ca/accessible_education/index.html

if you have any questions regarding accommodations.

Learning-skills counsellors at Learning Development and Success (https://learning.uwo.ca) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Additional student-run support services are offered by the USC, https://westernusc.ca/services/.