University of Windsor

Advanced Object-Oriented System Design Using C++

COMP-3400-30-R-2026W

Winter 2026

COURSE SYLLABUS

SCHOOL OF COMPUTER SCIENCE

LAND ACKNOWLEDGEMENT

The School of Computer Science at the University of Windsor *sits on the Traditional Territory of the Three Fires Confederacy of First Nations*. We acknowledge that this is the beginning of our journey to understanding the Significance *of the history of the Peoples of the Ojibway, the Odawa, and the Pottawatomie.*

INSTRUCTOR:

Mr. Paul Preney

E-mail: preney@uwindsor.ca

Office Location: Lambton Tower Room 3104

Office Hours: Tuesdays, 17:00 to 18:50 (5:00 P.M. to 6:50 P.M.)

Web Site: https://moodle.cs.uwindsor.ca

(The BrightSpace website for this course is only used to link to the above course web site and will not be used to publish assignments, projects, marks, etc. Instead, log in with your UWinID and password to the moodle.cs web site to access the materials, information, due dates, grades, etc. of this course..)

Note: Only email originating from a valid University of Windsor student account will be accepted from students wishing to contact the instructor or use the Uwindsor Bright Space email tool. Please include your full name, student ID and related course section in your correspondence. Do not spam with multiple or lengthy emails. Should you not receive timely feedback to your inquiries reach out during office hours directly, or in the event of no response contact the CS office at ***csinfo@uwindsor.ca*** *for support to access the instructor.*

*The course outline that is available after the end of the second week of the semester will be deemed correct and official.

Microsoft Teams will not be used by the instructor in this course. Additionally, the instructor finds Microsoft Teams use tends to result in inferior interactions than using email since it becomes harder to track posts, attachments, marking issues, etc. over the course of the semester using Teams, therefore, all electronic communications to the instructor is to be done using email sent to the address given above. Please ensure you send emails to the instructor from your uwindsor.ca email address with "COMP3400" somewhere in the subject line. Thank you.

TEACHING ASSISTANT(S):

Please refer to course web site for the GA/TA contact information and updated office hours.

The teaching assistant(s) will be holding regular weekly office hours dedicated to helping students. It is highly recommended that you take advantage of this resource by seeking interactive assistance toward understanding the course materials and guidance for completing the homework. Graders are also accessible to review your graded work and help make corrections or fix grading errors.

If you are facing difficulties in the course, please contact the instructor or the teaching assistant(s). You are expected to spend sufficient time completing all the readings and the assigned work.

If you are not able to get hold of the teaching assistant(s) during posted office hours or do not get a timely response from them please report the matter promptly to the course instructor with the situation details.

If you identify an exceptional assistant who goes above and beyond, please inform the instructor and consider nominating the person for related university/faculty awards for their commitment.

The School of Computer Science provides free tutoring services.

- Undergraduate Students https://tutor.myweb.cs.uwindsor.ca/
- MAC Students https://mactutor.myweb.cs.uwindsor.ca/

PRE-REQUISITES:

COMP-2120 and COMP-2560
No student is allowed to take a course more than two times without permission from the Dean.

LECTURES/LABS:

There are weekly lectures on Tuesdays from 19:00 to 21:50 (7:00 P.M. to 9:50 P.M.) each week in ER 3123.

There are no labs in this course.

COURSE DESCRIPTION*:

The main objective of this course is to explore advanced topics of the object oriented paradigm through the use of the C++ programming language. Topics covered include: advanced object oriented design, the use of abstraction to manage complexity, objects and classes, inheritance and class hierarchies, multiple inheritance, operator and method overloading, namespaces and visibility, templates, dynamic binding and virtual functions, exception handling, multi-threading and C++ standard library. In addition, the course will include a practical project, solving a real-life problem, implemented in C++, involving the client/server methodology, and an interface to a database using a graphics toolkit. (Prerequisites: COMP-2120, COMP-2560.) (3 lecture hours a week)
**This description is from the official senate-approved calendar*
(source: https://ctl2.uwindsor.ca/cuma/public/courses/pdf/48a0aaca-d673-4e13-9e80-3ccce6b0d71e **)**

LEARNING OUTCOMES:

At the end of the course, the successful student will know and be able to:

Learning Outcomes *At the end of this course, the successful student will know and be able to:*	**Characteristics of a University of Windsor Graduate** *A University of Windsor graduate will have the ability to demonstrate:*
Define and implement efficient and robust C++ program solutions for complex problems.	A. the acquisition, application and integration of knowledge
Use tools for top-down design approach to problem solving.	B. research skills, including the ability to define problems and access, retrieve and evaluate information (information literacy)
Prepare and create algorithmic solutions to a wide variety of problems.	C. critical thinking and problem-solving skills
	D. literacy and numeracy skills
Prepare projects following professional principles of protection of intellectual property.	E. responsible behaviour to self, others and society
Formulate and follow a schedule in order to complete a major project.	
Create project documentations.	F. interpersonal and communications skills
	G. teamwork, and personal and group leadership skills
Design aesthetically pleasing end user interfaces.	H. creativity and aesthetic appreciation
	I. the ability and derive for continuous learning

Note: Students are strongly encouraged in participating in the course development and update process. Please feel free to make recommendations for changes of the Learning Outcomes, Course Description, and Course Topics to the instructor or the program chair.

Instructor's Addendum

While C++ is "an object-oriented language", it should be said that C++, "supports object-oriented programming" as it supports *many* other programming paradigms. An aim of this course is to reasonably cover the current ISO C++ 2023 standard, parts of the upcoming ISO C++ standard, *and important underlying notions.* It is not possible to thoroughly cover everything in C++ in a single 12-week course, so if you've additional questions about something in C++, please do ask about such, e.g., during office hours, via email, etc.

Since there are no ISO C++ standard database, networking, or graphics APIs: "database" use will involve using IOStreams and <filesystem>; networking and graphics likely will not be covered however such are well supported by *many* available libraries.

REQUIRED TEXTBOOK:

The textbook below is required for this course:

Stroustrup, Bjarne (2023). A Tour of C++, Third Edition. Pearson Education, Inc. Boston, MA.
(ISBN-13: ISBN-13: 978-0-13-681648-5
ISBN-10: 0-13-681648-7)

- *Campus Bookstore: https://www.bkstr.com/uwindsorstore/home*
- *Leddy Library: https://leddy.uwindsor.ca/*

Besides the Campus Bookstore, you can also obtain these textbooks (physical, PDF, EPUB, and/or MOBI watermarked without DRM) via some of Pearson's web sites, e.g.,

- https://www.informit.com/
- https://www.pearson.com/en-ca.html

The course has assigned readings from this textbook. Besides being useful, etc. such readings constitute eligible material for tests and the final exam regardless of whether or not such has been otherwise discussed/presented/etc. in the course.

COURSE EVALUATION:

This course will be evaluated as follows: Activities 20%, Project 15%, Midterm 1 15%, Midterm 2 20%, Final Exam 30%. Activities are comprised of approximately six (6) assignments and/or some other activities weighted per what is seen on the course web site's Grades page. The Project due date and time is Sun. Mar. 29 at 23:55 (11:55 P.M.). All due dates and times are available and posted on the course web site. The final exam date, time, and location will be published by the Registrar later during the semester. Assigned textbook readings are all posted on the course web site. Reading and learning from the assigned textbook readings is mandatory. Assigned textbook readings may or may not correspond to what is covered in the lecture at those points in the course.

While no marks are allocated to attendance or participation in lectures, students are expected to attend all classes and learn the materials presented --not merely what is on the web site, in textbooks, or the C++ language itself. As this course aims to cover the latest and upcoming ISO C++ standards, lectures may, in fact, cover new materials that are otherwise largely not documented in the course textbooks, on web sites, etc. Googling may not yield easily understood/useful results –so attending classes is important. Attending classes also allows one to ask timely questions as material is being presented.

COURSE SCHEDULE:

Topics*

The instructor reserves the right to change the outline to accommodate student pace and understanding of the subject matter. Tentatively the topics to be covered in this course are:

- Jan. 6: Introduction, history, some notions and a tour of C++.
- Jan. 13: Object-based and oriented constructs; operator overloading; references, copies, and moves.
- Jan. 20: Pointers, iterators, algorithms, containers, ranges and views.
- Jan. 27: Templates, concepts, hashing, <tuple>, <variant>, and <random>.
- Feb. 3: Midterm 1 (1.25h); Concurrency: Part I
- Feb. 10: Concurrency: Part II
- *Feb. 17 - No class (study week).*
- Feb. 24: Concurrency: Part III
- Mar. 3: Midterm 2 (1.25h); <memory> and <atomic>; likely C++26 standard additions.
- Mar. 10: <memory_resource> and <mdspan>
- Mar. 17: To Be Announced.
- Mar. 24: <source_location>, <stacktrace> and other items
- Mar. 31: Review.
- NOTE: The final exam (3h) is sometime between April 9 and 20 (inclusive). The actual date and time is announced by the registrar.

NOTE: These topics are likely to be revised to better incorporate use of the latest and upcoming standards as well as toolchains' support of such. See the course web site for the current listing of topics.

***Note:** *Students are advised that the schedule and topics described above are tentative and that the material and/or depth and order of presentation are subject to change at the discretion of the instructor and student pace.*
This course assumes the student will allocate a significant amount of independent study and time spent on reading and researching materials as needed. You are strongly encouraged to ensure sufficient time needed to succeed in this course.

This course's midterms are 1.25h in length take place at the start of the class they are in and are currently:

- Tuesday, Feb. 3 from 7:00 P.M. to 8:15 P.M.
- Tuesday, Mar. 3 from 7:00 P.M. to 8:15 P.M.

Should any of the above midterm times not be able to occur, e.g., the university is officially closed due to weather reasons, then that midterm will take place *in the next class after that scheduled midterm time* and will be a *written, everyone-writes-at-one-time 1.25 hour* midterm *unless the instructor explicitly says otherwise*.

IMPORTANT DATES:

Winter 2026

Jan. 5: First day of classes
Jan. 18: Last day for late registration for Winter 2024 classes (to add classes)
Feb. 3: Winter financial drop date.
Feb. 14 to 22: Winter Term Reading Week
Feb. 16: Family Day (Statutory Holiday – University closed)
Feb. 20: University Closed
Mar. 15: Last day to voluntarily withdraw from Winter classes (to drop classes)

Apr. 3: Good Friday (Statutory Holiday – University closed)
Apr. 6: Last day of classes. (Apr. 6 is the makeup day for Good Friday)
Apr. 7 to 8: Pre-exam study days
Apr. 9 to 20: Winter Final Exams
Apr. 21: Alternate Exam Day

RESOURCES:

The course website is at ***https://moodle.cs.uwindsor.ca*** . Please check it frequently for announcements, course material, assignments, and other useful information. (The *https://brightspace.uwindsor.ca/* "course" simply links to the former and is *not* the course web site.)

GRADING:

A numeric grade on a scale of 0 to 100 will be assigned (rounded integer).

Passing grade:
A minimum grade of 50% is required to pass this course (70% for grad courses). Your individual program may have higher requirements to maintain good standing; please consult your program requirements and plan accordingly. If you are registered in a course and do not attend or participate or write any evaluations will be assigned a grade of NR (No report). You must withdraw from the course if you do not wish to attend it; not showing up does not constitute withdrawal and will impact your academic record.

Voluntary withdrawal (dropping the course):
You may drop a course within the first 2 weeks add/drop period (1 week in case of 6-week courses) without it showing up on your academic record. Please check with the Registrar's office calendar on the important dates for withdrawing voluntarily from a course after the add/drop period should you feel you need to withdraw. It is strongly recommended that you seek academic advice from your instructor or an academic advisor prior to withdrawing from courses.

Absences due to medical or other extenuating circumstances:
Medical leaves, illness, death (in the family), and other difficult circumstances as determined in bylaw 54 are at times unavoidable and would interrupt your academic career. You must report any issues to the instructor as soon as possible prior to considering any academic accommodations. The instructor reserves the right to determine if an accommodation is merited and the nature of the accommodation related to the course evaluation. All requests for alternate considerations on medical grounds or other difficult matters must be made in writing (email) to the instructor along with supporting documents absolutely no later than prior to the end of the course. No alternate accommodations will be considered after the end of the course.

Makeup and missed assessment policy:
If you miss a test, assignment, or other assessment in the course you will receive a zero mark for the missed work. If you wish to have alternate considerations due to a valid reason (as per senate bylaw 54) you must inform the instructor in writing (email) as soon as possible, preferably before the assessment, and not later than seven calendar days afterwards. Considerations for any make-up or late submissions will be done on a case-by-case basis on compassionate grounds while maintaining fairness as much as possible. No alternate considerations will be given to any missed assessment if the instructor is not informed within seven calendar days after its due date. The instructor will refuse any unsubstantiated and late requests.

Grade appeal:
Informal reviews and appeals of the marks for assignments, midterm, exams and/or projects will be considered only if requested within 10 days after the release of the corresponding grades. After the 10-day period students will have to submit a formal appeal if they wish within 6 weeks. See Senate Bylaws 54 (Undergraduate Students) and Senate Bylaws 55 (Graduate Students) for more details on appealing about grades.

Other Notes:
1.A. Undergraduate Students: (Please review Bylaw 54) The last seven calendar days prior to, and including, the last day of classes are free from any procedures for which a mark will be assigned. (Extensions on compassionate grounds are excluded). (In the case six weeks courses, the last three calendar days before the start of the examination period are free from any assessment procedures).
1.B. Unannounced quizzes/graded activities will not exceed 5% of the final grade.
1.C. Participation marks in online courses will not exceed 20% of the final grade.

2. The final exam schedule is announced by the Registrar's office, normally after the add/drop period, and students are expected to be available for the entire exam period and not make any prior travel plans, vacations, or other commitments until after the exam dates are announced. No alternate exams accommodations will be made on those grounds.

3. No forms of assessment shall be scheduled or made-due on days identified as break days such as reading weeks, holidays, or days that the University is officially closed.

SPTs:

The Student Perceptions of Teaching (SPTs) forms will be administered in the last two weeks of classes for courses 12-24 weeks in duration, in the last week of classes for courses 6-11 weeks in duration, or in the last two days of classes for courses of 5 or fewer weeks in duration. Students should be provided with up to 15 minutes at the beginning of a class to complete the SPTs online. Senate Policy

SUPPORT CONTACTS:

The School of Computer Science has a team of support staff and access to student academic advisors to assist you with any inquiries you may have about our courses and programs. Please use one of the following emails:
For CompSci undergraduate programs and advising, including IT certificate: csinfo@uwindsor.ca
For CS Tutors (free tutoring support for all CS undergrad courses): http://tutor.cs.uwindsor.ca/
For Computer Science Society: https://css.uwindsor.ca/
For CompSci graduate programs (MSc, MSc-AI stream, and PhD): csgradinfo@uwindsor.ca
For CompSci professional graduate programs (MAC/MAC-AI stream): macprogram@uwindsor.ca
For the office of the Director of the School of Computer Science: csdir@uwindsor.ca
For CompSci technical support: https://help.cs.uwindsor.ca/
For International Student Centre: https://www.uwindsor.ca/international-student-centre/
For Student Accessibility Services: https://www.uwindsor.ca/studentaccessibility/
For other general inquiries, https://ask.uwindsor.ca/
For Student counselling services (ext. 4616): https://www.uwindsor.ca/studentcounselling/
For Student health services (ext. 7002): https://www.uwindsor.ca/studenthealthservices/
For USci Faculty of Science student support network: https://www.uwindsor.ca/science/usci/

Good2Talk provides free, 24/7, single-session professional counselling and referral by phone to post-secondary students in Ontario. Services are provided in English and French, with translation services available in 100+ languages.

- Call: 1-866-925-5454 (reach professional counsellors)
- Text: GOOD2TALKON to 686868 (reach trained volunteers)

STUDENT ACCOMMODATIONS:

Students with disability:
Students who require academic accommodations in this course due to a documented disability must contact an Advisor in Student Accessibility Services (SAS) to complete SAS Registration and receive the necessary Letters of Accommodation. After registering with SAS, you must present your Letter of Accommodation and discuss your needs with the course instructor as early in the term as possible. Please note that deadlines for the submission of documentation and completed forms to SAS are available on their website:

- http://www.uwindsor.ca/studentaccessibility/

Exam conflicts:
If you have a conflict with two exams at the same time, you will need to talk to both instructors and ask which one is willing to move your exam to a different day or time.

If you have a conflict with examinations due to the following reasons, view the Office of Registrar Alternative Final Exam Policy:

- Conflict with religious conviction during the regularly scheduled time slot.
- Three or more final examinations in a 24-hour period.

Religious Observances:
Requests for accommodation of specific religious or spiritual observance must be presented to the instructor no later than 2 weeks *prior* to the conflict in question (in the case of final examinations within two weeks of the release of the examination schedule). In extenuating circumstances, this deadline may be extended. If the dates are not known well in advance because they are linked to other conditions, requests should be submitted as soon as possible in advance of the required observance. Timely requests will prevent difficulties in arranging constructive accommodations.

PRIVACY AND COPYRIGHTS:

Content confidentiality:
Lectures, examinations, quizzes, assignments, and projects given in this course are protected by copyright. Reproduction or dissemination of examinations or the contents or format of examinations/quizzes in any manner whatsoever (e.g., sharing content with other students or websites), without the express permission of the instructor is strictly prohibited. Students who violate this rule or engage in any other form of academic dishonesty will be subject to disciplinary action under Senate Bylaw 31: Student Affairs and Integrity.

Recording of lectures:
Lectures and discussions can be recorded by requesting explicit permission from the instructor. Students planning to do

so shall send a request (via email is sufficient) before the lecture is delivered. Students, however, are not allowed to post or share any recorded material to any other individual or party outside of this course.
See Senate Policy on recording lectures.

SAFETY, ACADEMIC INTEGRITY, AND NON-ACADEMIC MISCONDUCT:

Equity, Diversity, and Inclusiveness (EDI)
This course, along with all its components such as lab sections are, without question, safe places for students of all races, genders, sexes, ages, sexual orientations, religions, disabilities, and socioeconomic statuses. Disrespectful attitude, sarcastic comments, offensive language, or language that could be translated as offensive and/or marginalize anyone are absolutely unacceptable. Immediate actions will be taken by the instructor to protect the safety and comfort of the students. An ethnically rich and diverse multi-cultural world should be celebrated in the classroom. The instructor, too, must treat every student equally and with the respect and compassion that all students deserve. Furthermore, UWindsor is committed to combatting sexual misconduct. All members are required to report any instances of sexual misconduct, including harassment and sexual violence, to the Sexual Misconduct Response & Prevention Office so that the victim may be provided appropriate resources and support options.

- https://www.uwindsor.ca/sexual-assault/
- For police/ambulance emergency call 911 (in Canada)
- For campus police call 519-253-3000 ext. 4444 for emergency, and 1234 for non-emergency issues.

Academic Integrity
Please refer to: https://www.uwindsor.ca/academic-integrity/

As defined in the University of Windsor's **Student Code of Conduct**, plagiarism is the act of copying, reproducing or paraphrasing significant portions of one's own work, or someone else's published or unpublished material (from any source, including the internet), without proper acknowledgement, representing these as new or as one's own.

Tips and resources to help you prevent plagiarism:
https://www.uwindsor.ca/academic-integrity/sites/uwindsor.ca.academic-integrity/files/tips_for_preventing_plagiarism.pdf

The instructor will put a great deal of effort into helping students to understand and learn the material in the course. However, the instructor will not tolerate any form of cheating. The instructor will report any suspicion of academic integrity to the Director of the School of Computer Science. If sufficient evidence is available, the Director will begin a formal process according to the University Senate Bylaws which will lead to more review, a strict punishment if convicted, and a note on your permanent student record.

The following behaviours will be regarded as cheating:

- *Copying assignments or quizzes or presenting someone else's work as your own.*
- *Allowing another student to copy an assignment/project from you and present it as their own work; protect your own work and never share it with anyone!*
- *Copying from another student or any other unauthorized source during a test or exam.*
- *Falsifying your identity during the exam or having someone else assist or complete your assessment.*
- *Referring to notes, textbooks, and any unauthorized sources during a test or exam (unless otherwise stated).*
- *Speaking or communicating without permission during a test or exam.*
- *Not sitting in the pre-assigned seat during a test or exam.*
- *Communicating with another student in any way during a test or exam.*
- *Having unauthorized access to the exam/test paper prior to the exam/test.*
- *Explicitly asking a proctor for the answer to a question during an exam/test.*
- *Modifying answers after they have been marked.*
- *Any other behaviour which attempts unfairly to give you some advantage over other students during the grade-assessment process.*
- *Refusing to obey the instructions of the officer in charge of an examination.*

The list given above is not exhaustive. More examples are given in Appendix A, Senate Bylaws 31 – Complete guidelines and procedures on the sanctions imposed by the university are also listed in Table A.1 of the Senate Bylaws 31

In this course any assessment that is deemed plagiarized or in violation of the academic integrity policy will NOT BE GRADED and receive a grade of ZERO unless a different ruling is provided by the adjudication committee formally reviewing the case.

Examples of sanctioning include: see *Table A.1 in Appendix A of Bylaw 31. For first offence: mark reduction up to zero, censure 6-12 months; and for subsequent offence: suspension 4-24 months, censure up until graduation.*

Plagiarism detection software:
Plagiarism-detection software will be used for all student assignments in this course. You will be advised how to submit

your assignments. Note that students' assignments that are submitted to the plagiarism-detection software become part of the institutional database. This assists in protecting your intellectual property. However, you also have the right to request that your assignment(s) not be run through the student assignments database. If you choose to do so, that request must be communicated to the course instructor in writing at the beginning of the course. The instructor reserves the right to choose another plagiarism detection software and students will be notified once it is used.

Use of Generative AI (Artificial Intelligence) tools is prohibited:
Students cannot use Generative AI tools (e.g., ChatGPT, Bard) to produce assignments, projects, or reports. Any assignments, projects or reports submitted by students must be their own work and must be free from AI-generated content