Western Engineering

Western University

Faculty of Engineering

Software Engineering Program

AISE 2205A – ALGORITHMS AND DATA STRUCTURES FOR OBJECT ORIENTED DESIGN

Course Outline: Fall 2026 (Sept. 9 to Dec. 9)

No Classes on Sept. 30 (National Day for Truth and Reconciliation) and Oct. 10 to Oct 18 (Study break).

COURSE DESCRIPTION: This course surveys important computer algorithms and related data structures used in object-oriented software engineering. The course addresses the design, performance analysis and implementation of such algorithms by stressing their practical use and performance certification in large software applications. An understanding of how to "seal" designs to guarantee performance goals and ensure that all error conditions are caught will be discussed in this course.

ACADEMIC CALENDAR: Academic Calendar - Western University (uwo.ca)

PREREQUISITES: Computer Science 1026A/B or Engineering Science 1036A/B.

ANTIREQUISITES: Computer Science 2210A/B, SE 2205A/B

CEAB ACADEMIC UNITS: D3, ET1, ET2, KB3, KB4, PA1, PA2, PA3. Engineering Science 75%, Engineering Design 25%.

INSTRUCTOR INFORMATION:

Name:

Office/Office Hours:

Phone:

Email:

CONTACT HOURS:

Timetable information is available at https://draftmyschedule.uwo.ca/.

LECTURE:	Please Check the timetable
LABs and LAB Demonstrations:	DURATION/FREQUENCY- (2hrs /8 times during the term)
TUTORIAL:	None

RECOMMENDED REFERENCES:

1. Frank M. Carrano and Timothy M. Henry, Data Structures and Abstractions with Java, Prentice Hall, 5th Edition, 2019, ISBN 10: 0-13-483169-1 ISBN 13: 978-0-13-483169-5
2. Goodrich, Michael T., Roberto Tamassia, and Michael H. Goldwasser, Data structures and algorithms in Java, John Wiley & Sons, 6th Ed., 2014 (ISBN: 978-1-118-77133-4).
3. Gayle Laakmann McDowell. Cracking the Coding Interview, Career Cup, 6th Edition, 2015, ISBN: 978-0-9847828-5-7.
4. Raoul-Gabriel Urma, Mario Fusco, Alan Mycroft, Modern Java in Action: Lambdas, streams, functional and reactive programming (ISBN 9781617293566) (https://www.manning.com/books/modern-java-in-action?query=modern%20java)

GENERAL LEARNING OBJECTIVES (CEAB GRADUATE ATTRIBUTES)

Knowledge Base (KB)	D	Engineering Tools (ET)	D	Impact on Society	
Problem Analysis (PA)	D	Individual & Teamwork		Ethics and Equity	
Investigation		Communication		Economics and Project Mgmt.	
Design (D)	D	Professionalism		Life-Long Learning	

Notation: x represents the content level code as defined by the CEAB. blank = not applicable; I = introduced (introductory); D = developed (intermediate) and A = applied (advanced).

COURSE MATERIALS: Weekly content and guides for the laboratories will be available on the course OWL site. The material for this course will be taught in both lectures and labs; therefore, it is imperative that you attend each lecture and lab.

UNITS: SI

COURSE TOPICS AND SPECIFIC LEARNING OUTCOMES:

The following table summarizes the course learning outcomes along with CEAB GAIs where the GAIs in bold indicate ones to be measured and reported annually.

Course Topics and Specific Learning Objectives	**CEAB Graduate Attributes Indicators**
1. Java Fundamentals and Object-Oriented Principles (OPP) Revisited At the end of this section, students will be able to:	
a. Explain the Object-Oriented Principles.	**KB 3**
b. Identify the implementations of OOP principles in Java.	**KB 3**
c. Apply OOP in their programming with Java.	ET 2

2. More Java Features At the end of this section, students will be able to:	
a. Identify some features of Java programming including Composition, Aggregation	ET 1, ET 2
b. Recognize the benefits of Generics.	KB 4
c. Working with Exception handing, Recursions, and the likes	ET 1, ET 2
3. Fundamental Data Structures At the end of this section, students will be able to:	
a. Identify, implement, and use basic data structures including arrays, lists and linked lists.	**KB3**, ET1, ET2
b. Identify, implement, and use queues and stack data structures.	**KB3**, ET1, ET2
c. Identify, implement, and use tree and graph data structures.	**KB3**, ET1, ET2
d. Identify, implement, and use Maps and Hash Tables.	**KB3**, ET1, ET2
e. Recognize and work with Java Collections framework.	ET 1, ET 2
f. Recognize and work with Java Streams framework.	ET 1, ET 2
4. Algorithm Analysis At the end of this section, students will be able to:	
a. Recognize the concepts of algorithms analysis.	**KB 3**, PA 1
b. Perform Asymptotic analysis on any given algorithm.	**KB 3**, PA 1, **PA 2, PA 3**
5. Fundamental Algorithms At the end of this section, students will be able to:	
a. Recognize and implement the main search algorithms. Provide the rationale of using a specific algorithm for any given search problem.	**KB 3**, PA 1, **PA 2, PA 3**, D3
b. Recognize and implement the main selection algorithms.	**KB 3**, PA 1, **PA 2, PA 3**
c. Recognize and implement the main sorting algorithms. Provide the rationale of using a specific algorithm for any given sorting problem.	**KB 3**, PA 1, **PA 2,** D3
d. Recognize and implement the main tree algorithms.	**KB 3**, PA 1,

	PA 2, PA 3
e. Recognize and implement the main graph algorithms. Provide the rationale of using a specific algorithm for any given graphing problem.	**KB 3**, PA 1, **PA 2, PA 3**, D3

Evaluation:

Name	% Worth	Assigned	Due Date	CEAB GAs ASSESSED
Lab Exercise (Total = 6)	10%	Check the dates below	Check the dates below	ET1/ ET2/ D3
Lab Demo (Total = 2)	10%	Check the dates below	Check the dates below	ET1/ ET2/ D3
Mid-Term Examination	30%	Saturday/24/October (3pm - 5pm)	The Same	KB3
Final Examination	50%	TBA by the registrars		KB3/ PA2/ PA3
Bonus Quizzes (Total = 5)	5%	Check the dates below	Check the dates below	KB3

Note:

- A maximum-recorded mark for this course will be 100%, even if someone receives more than 100% mark after adding the bonus marks.
- The student who fails the Lab-Exercise part of the course can only receive a maximum grade of 50 on the course, even if all the components add up to 50% marks or more.

Lab exercises and Bonus Quizzes: To help the students follow with the material, there will be lab exercise in 6 different weeks, and a bonus quiz in five different weeks beginning from week 2 (See the dates below). The associated overall grade of these lab exercises is 10% and the lab demonstration will be 10% while the associated overall grade of the bonus quizzes is 5%. Since the Lab exercises will be available ahead of time, a very strict deadline will be maintained for the lab exercises. Also, the bonus quizzes will maintain strict deadlines.

Midterm Test:

Date:

Time:

Place:

<u>Important Dates:</u> Please note that the following dates are provided to have an idea of the time-management expectation. These dates may change based on the availability of resources (Exam room, TAs, Proctors etc.).

- Lab Exercise 1 / Bonus Quiz 1 - Open date: 14/Sept./2026; On-line cut-off date and time: 18/Sept./2026 at 11.55 pm.

- Lab Exercise 2 / Bonus Quiz 2 - Open date: 21/Sept./2026; On-line cut-off date and time: 25/ Sept./2026 at 11.55 pm.
- Lab Exercise 3 / Bonus Quiz 3 - Open date: 28/Sept./2026; On-line cut-off date and time: 2/Oct./2026 at 11.55 pm.
- In-Lab Demo Week (Grp 1/ Lab 1 to 3): Week of 5th of October (October 5 – October 9)
- In-Lab Demo Week (Grp 2/ Lab 1 to 3): Week of 19th of October (October 19 – October 23)
- Midterm:
- Lab Exercise 4 / Bonus Quiz 4 - Open date: 26/Oct./2026; On-line cut-off date and time: 30/Oct./2026 at 11.55 pm.
- Lab Exercise 5 / Bonus Quiz 5 - Open date: 2/Nov./2026; On-line cut-off date and time: 6/Nov./2026 at 11.55 pm.
- Lab Exercise 6 - Open date: 9/Nov./2026; On-line cut-off date and time: 13/Nov./2026 at 11.55 pm.
- Lab Demo Week (Group 1/ Lab 4 to 6): Week of 16th of November (November 16 – November 20)
- Lab Demo Week (Group 2/ Lab 4 to 6): Week of 23st of November (November 23 – November 27)

Final Examination:

Time: Examination will take place during the regular examination period.

Lab Attendance:

You are required to get help from the lab during the lab time. Also, attending the Lab, during Lab-demo week, is mandatory. To get any extra help from the TAs, the students will be required to get in touch with the TAs.

FACULTY OF ENGINEERING POLICIES:

Students must familiarize themselves with the policies of the Faculty of Engineering

https://www.eng.uwo.ca/electrical//pdf/2025-UG-Policy-and-Procedures.pdf

Faculty of Engineering Policies and Procedures-Undergraduate

Absence/Late Accommodation Policy

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.

Students missing a test/assignment/lab or examination will report the absence by submitting Academic Consideration Request form through STUDENT ABSENCE PORTAL.

- All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline. Academic consideration may include extension of deadlines, waiver of attendance requirements for classes/labs/tutorials, or re-weighting of course requirements.
- An instructor may deny academic consideration for any assessment that is not required in the calculation of the final grade (e.g., "8 of 10 quizzes"). Assessment flexibility must be indicated on the course outline.
- An instructor may deny academic consideration relating to the timeframe submission of work where there is already flexibility in the submission timeframe (e.g., 72-hour submission window). This assessment flexibility must be indicated on the course outline.
- 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 per course. Some assessments are excluded from this policy. Please refer to the course outline to determine if documentation isrequired.
- Requests without supporting documentation are limited to one per term per course.
- Please note that examinations scheduled during official examination periods always require official supporting documentation.
- If a student mistakenly submits their one allowed Academic Consideration request without supporting documentation for the assessments listed above that do not require academic consideration, the request cannot be recalled and reapplied. This privilege is forfeited.

An undocumented absence is only valid for a 24-hour period, from midnight on the day specified to midnight of the following day. An appropriate use of an undocumented absence would be for an in-class assessment that takes place that day. Where the time given to complete the assessment is longer than 24 hours, an undocumented absence will not cover a student for the full time given to complete the assessment, and flexibility considerations in submitting the assessment will override the undocumented absence.

NOTE: Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence (see below).

It is the student's responsibility to check the date, time and location of the Special Examination.

Religious Accommodation

When scheduling unavoidably conflicts with religious holidays, which (a) require an absence from the University or
(b) prohibit or require certain activities (i.e., activities that would make it impossible for the student to satisfy the academic requirements scheduled on the day(s) involved), no student will be penalized for absence because of religious reasons, and alternative means will be sought for satisfying the academic requirements involved. If a suitable arrangement cannot be worked out between the student and instructor involved, they should consult the appropriate Department Chair and, if necessary, the student's Dean.

It is the responsibility of such students to inform themselves concerning the work done in classes from which they are absent and to take appropriate action.

Academic Integrity

In the Faculty of Engineering, we encourage students to create a culture of honesty, trust, fairness, respect, responsibility, and courage, befitting the professional degree you are pursuing.

Please visit Academic Integrity Western Engineering for more information

Academic Offences

Plagiarism means using another's work without giving credit. The university has rules against plagiarism and other scholastic offences. Western Engineering has a zero-tolerance policy on plagiarism. The minimum penalty is zero on the course work and a repeat offence will earn you zero on the course. A third offence may lead to expulsion from the university.
Scholastic Discipline for Undergraduate Students & Cheating, Plagiarism and Unauthorized Collaboration: What Students Need to Know

Students must write their reports, essays and assignments in their own words. Whenever students take an idea or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. University policy states that cheating, including plagiarism, is a scholastic offence. The commission of a scholastic offence is attended by academic penalties, which might include expulsion from the program. If you are caught cheating, there will be no second warning.

All required papers may be subject to submission for textual similarity review to commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted will be included as source documents on the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between the University of Western Ontario and Turnitin.com (http://www.turnitin.com). Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, in the relevant section of the Academic Handbook:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

Faculty of Engineering AI Policy

The use of generative Artificial intelligence (GenAI) tools won't be discouraged in the Faculty of Engineering. As we pride ourselves on building the future we can't hide from the use of GenAI tools to contribute to the understanding of the course materials. Please refer to the course outline for the GenAI policy related to each course.

GenAI tools use won't be permitted in any type of examination or other assessments where the faculty have prohibited their use. If use of GenAI tools is detected by the instructor in these instances, academic offences penalties might be imposed against the student.

Accessibility

Western is committed to achieving barrier free accessibility for persons with disabilities studying, visiting and working at Western. As part of this commitment, there are a variety of services, groups and committees on campus devoted to promoting accessibility and to ensuring that individuals have equitable access to services and facilities. To help provide the best experience to all members of the campus community, please visit the Accessibility Western University for information on accessibility-related resources available at Western.
Students with disabilities may arrange for academic accommodation at Western. For a more detailed explanation, please visit Academic Support & Engagement -Academic Accommodation.

Inclusivity, Diversity, and Respect

The Faculty of Engineering at Western University is committed to creating equitable and inclusive learning environments that value diverse perspectives and experiences. We recognize that university courses often marginalize students based on social identity characteristics such as, but not limited to, Indigeneity, race, ethnicity, nationality, ability, gender identity, gender expression, sexuality, age, language, religion, and socioeconomic status. Understanding this, we strive to facilitate equitable experiences and inclusion within the classroom by respecting and integrating multiple ways of knowing, being, and doing. Please visit the Office of Equity, Diversity and Inclusion.

I. Health and Well-Being

Health & Wellness Services – Students - Offers appointment-based medical clinic for all registered part-time and full-time students.
Mental Health Support - Provides professional and confidential services, free of charge, to students needing assistance to meet their personal, social and academic goals. Services include consultation, referral, groups and workshops, as well as brief, change-oriented psychotherapy.
Crisis Support - For immediate assistant, please visit Thames Hall Room 2170 or call 519-661-3030. The crisis clinic operates between 11:00 am - 4:30 pm. For after-hours crisis support, click here.
Gender-Based Violence and Survivor Support - "Western is committed to reducing incidents of gender-based and sexual violence (GBSV) and providing compassionate support to anyone who is going through or has gone through these traumatic events. If you are experiencing or have experienced GBSV (either recently or in the past), you will find information about support services for survivors, including emergency contacts at the following website:
https://www.uwo.ca/health/student_support/survivor_support/gethelp.html To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Important Contacts

Engineering Undergraduate Services
Department of Electrical and Computer Engineering
Office of the Registrar/Student Central

Important Links

- WESTERN ACADEMIC CALENDAR
- ACADEMIC RIGHTS AND RESPONSIBILITIES
- ENGINEERING PROGRESSION REQUIREMENTS AND ACADEMIC REGULATIONS
- UNIVERSITY STUDENTS' COUNCIL (USC) - SERVICES
- IMPORTANT DATES AND DEADLINES
- ACADEMIC CONSIDERATION FOR MEDICAL ILLNESS - UNDERGRADUATE STUDENTS
- ACCOMMODATIONS FOR RELIGIOUS HOLIDAYS
- SCHEDULING OF ASSIGNMENTS, TESTS, AND EXAMINATIONS
- STUDENT FORMS
- OFFICE OF THE REGISTRAR
- RETENTION OF ELECTRONIC VERSION OF COURSE OUTLINES (SYLLABI)
- ACADEMIC APPEALS
- STUDENT ABSENCE PORTAL