

**DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING****SE2205A – ALGORITHMS AND DATA STRUCTURES FOR OBJECT ORIENTED DESIGN****Course Outline: Fall 2024**

**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 on 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 \(uwo.ca\)](https://www.uwo.ca/academic) OR [Academic Calendar - Western University \(uwo.ca\)](https://www.uwo.ca/academic)

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

**ANTIREQUISITES:** [Computer Science 2210A/B](https://www.uwo.ca/academic), [AISE 2205A/B](https://www.uwo.ca/academic)

**CEAB ACADEMIC UNITS:** D1, ET2, ET3, KB3, KB4, PA1, PA2, PA3. Engineering Science 75%, Engineering Design 25%.

**INSTRUCTOR INFORMATION:**

**Name:** Dr. Quazi M. Rahman, P.Eng., SMIEEE

**Office Hours:** Mondays, Wednesdays and Fridays: 9 am – 10 am; Other times: By appointment.

**Phone:** ext. 81399

**Email:** qrahman3@uwo.ca

**CONTACT HOURS:**

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

Lectures occur weekly starting September 5. Laboratory sessions occur weekly starting September 16.

<b>LECTURE:</b>	Please Check the timetable
<b>LAB:</b>	DURATION/FREQUENCY- (2hrs /8 times during the term)
<b>TUTORIAL:</b>	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
<b>1. Java Fundamentals and Object-Oriented Principles (OPP) Revisited</b> At the end of this section, students will be able to:	
a. Explain the Object-Oriented Principles.	<b>KB 3</b>
b. Identify the implementations of OOP principles in Java.	<b>KB 3</b>
c. Apply OOP in their programming with Java.	ET 2

<b>2. More Java Features</b>	
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 handling, Recursions, and the likes	ET 1, ET 2
<b>3. Fundamental Data Structures</b>	
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.	<b>KB3</b> , ET1, ET2
b. Identify, implement, and use queues and stack data structures.	<b>KB3</b> , ET1, ET2
c. Identify, implement, and use tree and graph data structures.	<b>KB3</b> , ET1, ET2
d. Identify, implement, and use Maps and Hash Tables.	<b>KB3</b> , 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
<b>4. Algorithm Analysis</b>	
At the end of this section, students will be able to:	
a. Recognize the concepts of algorithms analysis.	<b>KB 3</b> , PA 1
b. Perform Asymptotic analysis on any given algorithm.	<b>KB 3</b> , PA 1, <b>PA 2</b> , <b>PA 3</b>
<b>5. Fundamental Algorithms</b>	
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.	<b>KB 3</b> , PA 1, <b>PA 2</b> , <b>PA 3</b> , D3
b. Recognize and implement the main selection algorithms.	<b>KB 3</b> , PA 1, <b>PA 2</b> , <b>PA 3</b>
c. Recognize and implement the main sorting algorithms. Provide the rationale of using a specific algorithm for any given sorting problem.	<b>KB 3</b> , PA 1, <b>PA 2</b> , D3

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

### EVALUATION:

Name	% Worth	Assigned	Due Date	CEAB GAS ASSESSED
Labs (Total = 6)	20%	Check the dates below	Check the dates below	
Mid-Term Examination	30%	Saturday/26/October (3pm - 5pm)	The Same	
Final Examination	50%	TBA by the registrars		
Bonus Quizzes (Total = 5)	5%	Check the dates below	Check the dates below	

### 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 48 in 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 a 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 20% 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: Saturday, 26<sup>th</sup> of October 2024

Time: 3 pm – 5 pm

Place: TBA

**Important Dates:** 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: 16/Sept./2024; On-line cut-off date and time: 21/Sept./2024 at 11pm.

- Lab Exercise 2 / Bonus Quiz 2 - Open date: 23/Sept./2024; On-line cut-off date and time: 28/ Sept./2024 at 11pm.
- Lab Exercise 3 / Bonus Quiz 3 - Open date: 29/Sept./2024; On-line cut-off date and time: 5/Oct./2024 at 11pm.
- Lab Demo Week (Group 1/ Lab 1 to 3): Week of 7<sup>th</sup> of October (October 7 – October 11)
- Lab Demo Week (Group 2/ Lab 1 to 3): Week of 21<sup>st</sup> of October (October 21 – October 25)
- Midterm: Saturday, 26<sup>th</sup> of October, 3 pm – 5 pm, Place: TBA
- Lab Exercise 4 / Bonus Quiz 4 - Open date: 20/Oct./2024; On-line cut-off date and time: 27/Oct./2024 at 11pm.
- Lab Exercise 5 / Bonus Quiz 5 - Open date: 4/Nov./2024; On-line cut-off date and time: 8/Nov./2024 at 11pm.
- Lab Exercise 6 - Open date: 11/Nov./2024; On-line cut-off date and time: 15/Nov./2024 at 11pm.
- Lab Demo Week (Group 1/ Lab 4 to 6): Week of 18<sup>th</sup> of November (November 18 – November 22)
- Lab Demo Week (Group 2/ Lab 4 to 6): Week of 25<sup>th</sup> of November (November 25 – November 29)

**Final Examination:**

Time: Examination will take place during the regular examination period (9 Dec – 22 Dec).

**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.

**ABSENCE FROM MANDATORY COURSE COMMITMENTS:**

Students must familiarize themselves with the Policy on **Academic Consideration for Absences:**

<https://www.eng.uwo.ca/undergraduate/academic-consideration-for-absences.html>

**I. Missed/Late Accommodation Policy**

1. The Academic Consideration Request Form is available through the STUDENT ABSENCE PORTAL.
2. Documentation must be provided as soon as possible. Requests for academic consideration must include the following components:
  - a. Indication of the course(s) and assessment(s) affected by the request
  - b. Medical note, and
  - c. Additional supporting documentation as relevant

3. Requests for academic consideration without a medical note or other supporting documentation may be accepted once per term, per course.
4. Undocumented absences cannot be used for examinations scheduled by the Office of the Registrar during official examination periods (including take-home final exams and December mid-year exams for full courses) and practical laboratory and performance tests typically scheduled in the last week of the term. Undocumented absences also cannot be used for the “designated assessment” in each course. When flexibility in assessment exists and is clearly stated on the course outline, both undocumented absences and academic consideration requests with documentation may be denied.
5. Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence.

## II. Exam Accommodation

1. If you are unable to write a final examination, report your absence using the Academic Consideration Request Form through [STUDENT ABSENCE PORTAL](#).
2. Be prepared to provide the Undergraduate Services Office with supporting documentation (see next page for information on documentation) the next day, or as soon as possible (in cases where students are hospitalized). **The following circumstances are not considered grounds for missing a final examination or requesting special examinations: common cold, headache, sleeping in, misreading timetable and travel arrangements.**
3. In order to receive permission to write a Special Examination, you must obtain the approval of the Chair of the Department and the Associate Dean and in order to apply you must submit an the Academic Consideration Request Form through [STUDENT ABSENCE PORTAL](#).  
**PLEASE NOTE: It is the student's responsibility to check the date, time and location of the Special Examination.**

## III. LATE ASSIGNMENTS

### IV. Medical Accommodation

1. Requests for Academic Consideration Request Form through [STUDENT ABSENCE PORTAL](#).
2. Requests for academic consideration must include the following components:
  - a. Self-attestation signed by the student (*This is only accepted for the first/one absence*)
  - b. Medical note. Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence.
  - c. Indication of the course(s) and assessment(s) affected by the request
  - d. Supporting documentation as relevant
3. Requests without supporting documentation are limited to one per term per course.
4. **Students must request academic consideration as soon as possible and no later than 48 hours after the missed assessment.**
5. Once the request and supporting documents have been received and reviewed, appropriate academic consideration, if granted, shall be determined by the instructor in consultation with the academic advisor, in a manner consistent with the course outline.

Academic consideration may include extension of deadlines, waiver of attendance requirements for classes/labs/tutorials, or re-weighting of course requirements. Some forms of academic consideration, such as arranging Special Examinations, assigning a grade of Incomplete, or granting late withdrawals without academic penalty, may only be granted by the Academic Advising office of the Faculty of Registration.

6. **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.
7. **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.

#### V. **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.

#### VI. **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](#)

#### VII. **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](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf)

### VIII. **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. However, the use of GenAI tools in any assignment or contribution during the course will have to be disclosed, as a resource.

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.

### IX. **Use of English Policy**

In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests, and examinations for improper use of English. Additionally, poorly written work except for the final examination may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

### X. **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](#).

### XI. **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](#).

### XII. **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 assistance, 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](#) and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced gender-based or sexual violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts, [here](#). To connect with a case manager or set up an appointment, please contact [support@uwo.ca](mailto:support@uwo.ca).



### Important Contacts

<a href="#">Engineering Undergraduate Services</a>	SEB 2097	519-661-2130	engugrad@uwo.ca
<a href="#">Electrical and Computer Engineering</a>	TEB 279	519-661-2111 x86264	eceugrad@uwo.ca
<a href="#">Office of the Registrar/Student Central</a>	WSSB 1120	519-661-2100	

### 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](#)