

**Western University
Faculty of Engineering
Department of Electrical and Computer Engineering**

ES1036B: Programming Fundamentals for Engineers

Course Outline 2021-22 (January 10/Monday, 2022 – April 8/Friday, 2022)

<https://www.uwo.ca/stats/undergraduate/key-dates.html>

No classes/labs/Exams on the following dates:

Family day and Spring Reading Week; 19-27 February 2022

Description: This course is intended to establish a foundation for Computer Programming with specific emphasis on Engineering problems and applications. The course will cover the introductory aspects of Object-Oriented Analysis, Design, and Implementation (using Java) techniques, along with Testing according to the specified requirements of the program. Computer Programming will be treated as part of the Engineering Process, and as such will be contextualized through the course according to the Engineering Profession. A tutorial on MATLAB will be provided in the end.

Instructor: Dr. Quazi Mehbubar Rahman, Ph.D., P.Eng., SMIEEE
TEB 263, 519-661-2111 ext. 81399, qrahman3@uwo.ca
Consultation hours: Wednesdays 4.15 pm – 5.15 pm on OWL via Zoom [Any change on this time slot will be communicated to the students via owl]

Academic Calendar Copy:

https://www.westerncalendar.uwo.ca/Courses.cfm?CourseAcadCalendarID=MAIN_019426_1&SelectedCalendar=Live&ArchiveID=

Designing, implementing and testing computer programs using Java and MATLAB to fulfill given specifications for small problems using sound engineering principles and processes. Awareness of the engineering aspects of the process of constructing a computer program.

Contact Hours: 3 lecture hours, 2 laboratory hours, 0.5 course.

Antirequisite: Computer Science 1025A/B, Computer Science 1026A/B.

Prerequisites:

Co-requisite:

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the prerequisites.

CEAB Academic Units: Engineering Science 100%.

Required Textbook: None

Other Required References: Course notes and supplementary material that are available at the Course Web site (OWL)

References (Not required):

- Tony Gaddis, Starting Out with Java: Early Objects, 6th Edition, ISBN: 9780134462011, 2017, Pearson.
- Y. Daniel Liang, Introduction to Java Programming, 11th edition, ISBN 10: 0133252817; ISBN-13: 9780133252811; Pearson.
- Tutorial slides on MATLAB will be provided.

General Learning Objectives (CEAB Graduate Attributes)

Knowledge Base	I	Use of Engineering Tools	I	Impact on Society and the Environment	
Problem Analysis		Individual and Teamwork		Ethics and Equity	
Investigation		Communication Skills		Economics and Project Management	
Design		Professionalism		Life-Long Learning	

Notation: *I: Introductory, D: Intermediate, A: Advanced, or blank.* I – The instructor will introduce the topic at the level required. It is not necessary for the student to have seen the material before. D – There may be a reminder or review, but the student is expected to have seen and been tested on the material before taking the course. A – It is expected that the student can apply the knowledge without prompting (e.g., no review).

Course Objectives and Specific Learning Outcomes	CEAB GA Indicators (for Internal use only)
<p>1. Introduction to Computers and Java: Introduces the field of software engineering, and covers the fundamentals of hardware, software, programming languages, and the software development process. Discussed through the examination of a simple program the elements of a program, such as key words, variables, operators, and punctuation. Present an overview of entering source code, compiling it, and executing it. Give a brief history of Java as well.</p> <p>At the end of this section, students will be able to:</p> <ol style="list-style-type: none"> identify different components of a computer system, identify different steps in software development process, compile and run a Java program with or without using IDE, relate the history and the releases of Java language. 	N/A
<p>2. Java Fundamentals: Introduces data types, identifiers, variable declarations, constants, comments, program output, and arithmetic operations. This introduction also includes the conventions of programming style.</p> <p>At the end of this section, students will be able to:</p> <ol style="list-style-type: none"> understand different types of variable/constant declarations, different JAVA operators and standard input/output statements 	KB 4

<p>b. solve simple problems by writing the program (code) in JAVA language.</p>	<p>KB 4</p>
<p>3. Methods: Introduces generic methods, methods in Java, method overloading, scopes, and call stack. At the end of this section, students will be able to:</p> <ul style="list-style-type: none"> a. understand the concept of methods, define a method, call a method, overload a method. b. understand the scope rule for identifiers 	<p>ET 2 KB 4</p>
<p>4. Classes and Objects: Introduces the student to classes and its principle of Encapsulation. Once the student learns about fields and methods, UML diagrams are introduced as a design tool. Arguments and parameters are also discussed. Finally, the concept of the default constructor is discussed. At the end of this section, students will be able to:</p> <ul style="list-style-type: none"> a. write simple member methods, constructors and understand the concept of the default constructors, b. understand the concept of the Object-Oriented design, c. define classes and create objects. d. understand the static methods and fields, interaction between objects, passing objects as arguments, and returning objects from methods. 	<p>ET 2 KB 4 ET 2 KB 4</p>
<p>5. Control Structures: Explores relational operators and relational expressions and shows how to control the flow of a program with the conditional and switch statements. Covers Java’s repetition control structures. Counters, accumulators, running totals, sentinels, and other application-related topics In addition, discusses the objects comparison. At the end of this section, students will be able to:</p> <ul style="list-style-type: none"> a. write if, if/else, if/else if and switch statements, b. understand the concept of objects comparison with the equals, compareTo, equalsIgnoreCase, and compareToIgnoreCase methods. c. write while loop, do-while loop, and for loop, d. find the common uses for the repetition control techniques. 	<p>ET 2 KB 4 ET2 ET1</p>
<p>6. Arrays and Files: Shows students how to create and work with single and multidimensional arrays. Demonstrate the most common array-processing techniques. Simple file operations for reading and writing text files are also covered. At the end of this section, students will be able to:</p> <ul style="list-style-type: none"> a. create single and multidimensional arrays, and an array to a method, b. calculate the sum of the elements in an array, finding the highest and lowest values, and sequentially search an array. c. Create file to write some text or, overwrite or append a file with some text d. Read info from a text file, process and write to a text file 	<p>KB 4 KB 4 ET2 ET2</p>

7. Inheritance and polymorphism: Cover superclass and subclass constructors, method overriding, polymorphism and dynamic binding, protected and package access, class hierarchies, abstract classes and methods, and interfaces. At the end of this section, students will be able to:	
a. understand the concept of generalization and specialization relationships,	KB 4
b. create a new class to be based on an existing class, call the superclass constructor, and override superclass methods,	KB 4
c. define abstract classes, abstract methods, and interfaces,	KB 4
d. understand the concepts of polymorphism.	KB 4
8. Introduction to MATLAB: A Tutorial that includes information on how to	
a. work with the Matlab environment	ET 2
b. use command line calculations in Matlab	ET 2
c. perform simple calculations and plot simple graphs.	ET 2

Evaluation

Course Component	Weight
Bonus - Assessment from reading the course handout	5%
Quizzes (Maximum 10)	20%
Laboratory Assignments (Maximum 10)	15%
Midterm Test	25%
Final Examination	40%

Bonus - Assessment from reading the course handout: This part will be composed of open-book quizzes and/or extra lab work. *Note: Bonus grade will NOT be added to the course grade for any student who will apply for SRA (it does not include approved accommodation) on any other assessments (Lab/Midterm/Quiz) in this course.* Please note that, after adding the bonus, the maximum grade that can be earned in this course will not exceed 100.

Online Quizzes: To help the students follow the course materials there will be a quiz every week, starting during the week of January 31st except for the week of 21st of February and the week of 4th of April. All Quizzes will be graded with equal weights. However, two worst quiz grades will be dropped from the final quiz average (20%). *Note: If any student misses any quiz due to approved absence or SRA, that missing quiz will be considered as one of the worst quizzes.*

Laboratory Activities: (**The labs will be conducted online, until further notice**) There will be lab activities every week (starting during the week of January 24th except for the week of 21st of February) in which students will work on programming assignments on the already discussed course materials to solve and submit their work online after demonstrating their understanding to the TAs. Each assignment will be posted on OWL at least 5 days ahead of the due date, students can work on it immediately and they can submit their solution anytime on or before the due date. *The student can submit the lab late only by a day with a penalty of 30%.* The TAs will be available

via zoom during the lab hours to help with lab related questions and take the demo. No late submission will be accepted.

Midterm Exam: 1.5-hour long programming exam on Saturday Mar. 12th from 3 pm to 4.30 pm (The mode of this exam will be decided based on the COVIT-19 scenario around that time).

Final Examination: Will take place during the regular final-exam period (The mode of this exam will be decided based on the COVIT-19 scenario around that time).

Grading and Feedback:

- The quizzes will be graded automatically or manually, and grades will be posted on OWL-gradebook within a week.
- All lab assignments and exams submissions will be graded manually, and the code similarity check will be done using the similarity-detection software system “Moss”. More information about this system is available at the following link: <https://theory.stanford.edu/~aiken/moss/>.
- If the mode is on-line, the midterm and final examinations of this course will be conducted using the remote proctoring service, Proctortrack. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide personal information (including some biometric data), and the session will be recorded. More information about this remote proctoring service is available in the Online Proctoring Guidelines at the following link:
<https://www.uwo.ca/univsec/pdf/onlineproctorguidelines.pdf> .
 - For on-line mode, completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. Information about the technical requirements is available at the following link: <https://www.proctortrack.com/tech-requirements/> .

Online Lectures and Labs: A synchronous learning mode (via Zoom) will be offered to the students during the scheduled lecture and lab times, mainly for the discussions on the course topics and lab assignments and their assessments. These sessions may be recorded and then posted on OWL. Please note that, the data captured during these recordings may include your image, voice recordings, chat logs and personal identifiers (name displayed on the screen). The recordings will be used for educational purposes related to this course, including evaluations. The recordings may be disclosed to other individuals participating in the course for their private or group study purposes. Please contact the instructor if you have any concerns related to session recordings. Participants in this course are not permitted to record the sessions, except where recording is an approved accommodation, or the participant has the prior written permission of the instructor.

Pre-recorded Lectures: **Pre-recorded modules may be offered as** an asynchronous learning mode. In each week, new materials will be added on OWL that include lecture slides, mini lecture videos (recorded by the instructor, **if needed**) to cover the course core objectives, mini lab/tutorial videos (reordered by the instructor and/or the TAs, if needed) to cover the lab requirements, grading policy and the expected outcomes.

Online Discussions Board: An asynchronous online discussion forum will be available on OWL to promote communication and collaboration among students, TAs and the instructor. Students

can post any questions, concerns, or comments that they may have about the course subject matter or the course itself. The Instructor and several TAs will be monitoring this board. To ensure the best experience for all, please honour the following protocols:

- Everyone has to be very watchful about what is said in this on-line public space. Student found abusive may be subject to disciplinary measures under the Code of Student Conduct.
- Share your knowledge. If you can help someone, go right ahead.
- Be forgiving, we all make mistakes.
- Hope you will make good use of this valuable resource.

Online activities Protocols:

Some components of this course will involve online interactions. To ensure the best experience for both you and your classmates, please honour the following protocols:

- please “arrive” to class on time
- please use your computer and/or laptop if possible (as opposed to a cell phone or tablet)
- ensure that you are in a private location to protect the confidentiality of discussions in the event that a class discussion deals with sensitive or personal material
- to minimize background noise, kindly **mute your microphone for the entire class until you are invited to speak**, unless directed otherwise

The course instructor will act as moderator for the class and will deal with any questions from participants. To participate please consider the following:

- If you wish to speak, use the “raise hand” function and wait for the instructor to acknowledge you before beginning your comment or question
- Remember to unmute your microphone before speaking
- Self-identify when speaking.
- Remember to mute your mic after speaking (unless directed otherwise)

General humble considerations:

- Keep in mind the different cultural and linguistic backgrounds of the students in the course.
- Be courteous toward the instructor, your colleagues, and authors whose work you are discussing.
- Be respectful of the diversity of viewpoints that you will encounter in the class and in your readings. The exchange of diverse ideas and opinions is part of the scholarly environment. “Flaming” is never appropriate.
- Be professional and scholarly in all online postings. Cite the ideas of others appropriately.

Note that disruptive behaviour of any type during online classes, including inappropriate use of the chat function, is unacceptable. Students found guilty of Zoom-bombing a class or of other serious online offenses may be subject to disciplinary measures under the Code of Student Conduct.

Use of English: 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.

Missed Midterm Examinations: If a student misses a midterm examination, she or he must follow the Instructions for Students Unable to Write Tests and provide documentation to Undergraduate Services Office within 24 hours of the missed test. If accommodation is granted, the instructor will add midterm weight to the final exam. If no reasonable justification for missing the test can be found, then the student will receive a mark of zero for the test.

If a student is going to miss the midterm examination for religious reasons, they must inform the instructor in writing within 48 hours of the announcement of the exam date or they will be required to write the exam.

For more information concerning medical accommodations, see the relevant section of the Academic Handbook:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf

For more information concerning accommodations for religious holidays, see the relevant section of the Academic Handbook:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

Cheating and Plagiarism: Students must write their 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

Use of Electronic Devices: Students may use laptops, tablet computers, or smart phones only to access the course OWL site during lectures and tutorials. Use of nonprogrammable calculators only is permitted during quizzes and examinations. No other electronic devices may be used at any time during lectures, tutorials, or examinations.

Policy on Repeating All Components of a Course: Students who are required to repeat an Engineering course must repeat all components of the course. No special permissions will be granted enabling a student to retain laboratory, assignment, or test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted by the student for grading in subsequent years.

Internet and Electronic Mail: Students are advised to use Western email-account when they need to communicate with the instructor or the TAs. Students are responsible for regularly checking their Western email and the course web site (<https://owl.uwo.ca/portal/>) and making themselves aware of any information that is posted about the course.

Accessibility: Please contact the course instructor if you require material in an alternate format, or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 519-661-2111 ext. 82147 for any specific question regarding an accommodation.

Support Services:

Office of the Registrar, <http://www.registrar.uwo.ca/>

Student Development Centre, <http://www.sdc.uwo.ca/>

Engineering Undergraduate Services, <http://www.eng.uwo.ca/undergraduate/>

USC Student Support Services, <http://westernusc.ca/services/>

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

The Class Schedule (**ignore the locations for on-line meeting**):

Section	Component	Class Nbr	Days	Start Time	End Time	Location	Instructor
001	LEC	4194	M W F	11:30 AM	12:30 PM	SEB-2200	Q. Rahman
002	LEC	8227	M W F	10:30 AM	11:30 AM	SEB-2200	Q. Rahman
003	LAB	4195	M	1:30 PM	3:30 PM	ACEB-2415	Q. Rahman
004	LAB	4196	M	4:30 PM	6:30 PM	ACEB-2415	Q. Rahman
005	LAB	4197	M	7:00 PM	9:00 PM	ACEB-2415	Q. Rahman
006	LAB	4198	W	5:30 PM	7:30 PM	ACEB-2415	Q. Rahman
007	LAB	12006	Th	4:30 PM	6:30 PM	ACEB-2415	Q. Rahman
008	LAB	12829	Tu	2:30 PM	4:30 PM	ACEB-2400	.