Western University
Faculty of Engineering
Department of Electrical and Computer Engineering

ES1036A: Programming Fundamentals for Engineers
Course Outline 2021-22

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 and MATLAB) 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.

Instructor: Dr. Abdelkader Ouda, Ph.D., P.Eng.
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                            Office/Consultation hours: Tuesdays 12:30pm – 2:30pm

Academic Calendar Copy:

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 necessary 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)

Reference Book (Not required):
- Tony Gaddis, Haywood Community College, 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.
- In addition, any introductory level MATLAB textbook would be enough.

General Learning Objectives (CEAB Graduate Attributes)

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

Notation*: where x be I: Introductory, D: Intermediate, A: Advanced, or empty*. 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)

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.
 	
At the end of this section, students will be able to:
    a. identify different components of a computer system,
    b. identify different steps in software development process,
    c. compile and run a Java program with or without using IDE,
    d. relate the history and the releases of Java language.
	N/A

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.
 	
At the end of this section, students will be able to:
    a. understand different types of variable/constant declarations, different JAVA operators and standard input/output statements
    b. solve simple problems by writing the program (code) in JAVA language.
	KB 4
	
	KB 4

3. Classes and Objects: Introduces the student to classes. 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:
    a. write simple methods, constructors and understand the concept of the default constructors,
    b. understand the concept of the Object-Oriented design,
    c. write classes and create objects,
    d. understand the static methods and fields, interaction between objects, passing objects as arguments, and returning objects from methods.
	ET 2
	
	KB 4
	ET 2
	KB 4

4. Decision Structures: Explores relational operators and relational expressions and shows how to control the flow of a program with the conditional and switch statements. In addition, discusses the objects comparison.
 	
At the end of this section, students will be able to:
    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.
	ET 1
	KB 4

5. Loops and Files: Covers Java's repetition control structures. Counters, accumulators, running totals, sentinels, and other application-related topics are discussed. Simple file operations for reading and writing text files are also covered.
 	
At the end of this section, students will be able to:
    a. write while loop, do-while loop, and for loop,
    b. find the common uses for the repetition control techniques.
	ET 2
	ET 1

6. Arrays: Shows students how to create and work with single and multidimensional arrays. Demonstrate the most common array-processing techniques.
 	
At the end of this section, students will be able to:
    a. create single and multidimensional arrays, and pass 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.
	KB 4
	KB 4

7. Inheritance and polymorphism: Covers 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,
    b. create a new class to be based on an existing class, call the superclass constructor, and override superclass methods,
    c. define abstract classes, abstract methods, and interfaces,
    d. understand the concepts of polymorphism.
	KB 4
	
	KB 4
	
	KB 4
	
	KB 4

8. Introduction to MATLAB: Explores the basic features of MATLAB that are useful for engineering classes.
 	
At the end of this section, students will be able to:
    a. work with the Matlab environment
    b. use command line calculations in Matlab
    c. perform simple calculations and plot simple graphs.
	ET 2
	ET 2
	ET 2

Evaluation

Course Component	Weight
Quizzes	20%
Laboratory Assignments	20%
Midterm Test	20%
Final Examination	40%

Online Quizzes: To help the students follow with the material there will be 8 online quizzes in total, one quiz per week starting September 20th except weeks 6, 9, 13, and 14. The quiz questions will be taken from the course components used in the lab-assignment. In some quizzes, the student might be asked to write small-size Java programs. All Quizzes will be graded with equal weights, however only the top 6 marks will be considered toward the quiz portion (20%) of the course. **No late submission will be accepted.**

On-Campus Laboratory Activities: There will be in person lab activities every week (starting September 20th except weeks 6, 9, 13, and 14) in which students will implement the covered course material to solve and submit eight assignments online. Each assignment will be posted on Monday on OWL, students can work on it immediately and they can submit their answer anytime during the week until the end of Saturday (11:55 PM) of the same week. The TAs will be available in person in the computer labs during the lab hours to help with lab related questions. **No late submissions will be accepted**.

Midterm Exam: A closed book on-campus exam for one hour. The time and place will be announced in OWL.

Final Examination: the final examination is a closed book on-campus exam for three hours and will take place during the regular examination period.

Grading and Feedback:

- The quizzes are graded automatically or manually, and grades will be posted on OWL gradebook within a week.
- All labs assignments and exams submissions will be graded manually, and the code similarity check will be made using the similarity-detection software system "Moss". More information about this system is available at the following link: https://theory.stanford.edu/~aiken/moss/.
- Midterm and final examinations in this course will be on-campus exams.

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. **Bonus points will be added to the students' final marks who would participate** (for example, read questions, post questions, or respond to peers' questions) in this forum through the discussion board. To ensure the best experience for all, please honour the following etiquettes:

- Be careful of what you say, this is a public place. 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, but do not post ant solutions or parts of it.
- Be forgiving, we all make mistakes
- Hope you will make good use of this valuable resource.

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 with the exception of 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, **the exam will not be rescheduled.** The student must follow the Instructions for Students Unable to Write Tests and provide documentation to their department within 24 hours of the missed test. The department will decide whether to allow the reweighting of the test, where reweighting means the marks normally allotted for the midterm will be added 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 responsible for regularly checking their Western e-mail 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.