

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

ES1036A: Programming Fundamentals for Engineers

Course Outline 2019-20

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.
ACEB 4452, 519-661-2111 ext. 81299, aouda@uwo.ca
Consultation hours: Monday, 12:30 pm – 2:30 pm.

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 MATLAB textbook would mostly like be sufficient.

General Learning Objectives (CEAB Graduate Attributes)

| | | | | | |
|------------------|-----|--------------------------|--|---------------------------------------|--|
| Knowledge Base | 2/1 | Use of Engineering Tools | | 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: x/y , where x is the cognitive level (1: Remember, 2: Understand, 3: Apply) at which the attribute is assessed and y is the academic level (1: Beginner, 2: Intermediate, 3: Advanced) at which the attribute is assessed.

Topics and Specific Learning Objectives

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:

- identify different components of a computer system,
- identify different steps in software development process,
- compile and run a Java program,
- use an IDE,
- relate the history and the releases of Java language.

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:

- understand different types of variable/constant declarations, different JAVA operators and standard input/output statements
- solve simple problems by writing the program (code) in JAVA language.

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 void methods, as well as simple methods that return a value,
- b. write constructors and understand the concept of the default constructors,
- c. understand the concept of the Object-Oriented design
- d. identify classes and their responsibilities.
- e. write classes and create objects.
- f. understand the static methods and fields, interaction between objects, passing objects as arguments, and returning objects from methods.

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, and if/else if statements,
- b. use the conditional operator and write the switch statement,
- c. understand the concept of objects comparison with the equals, compareTo, equalsIgnoreCase, and compareToIgnoreCase methods.

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.

6. Arrays and the ArrayList Class

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,
- b. pass an array to a method,
- c. calculate the sum of the elements in an array, finding the highest and lowest values, and sequentially search an array.

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,
- c. call the superclass constructor, and override superclass methods,
- d. define abstract classes and abstract methods,
- e. define and use interfaces,
- f. understand the concepts of polymorphism.

8. Java Exceptions

Introduces exceptions handling as well as developing and throwing custom exceptions.

At the end of this section, students will be able to:

- a. write code that detects exceptions due to errors or unexpected events.
- b. write code to intercept and respond to exceptions.

9. Introduction to JavaFX

Presents the basics of developing graphical user interface (GUI) applications with JavaFX.

At the end of this section, students will be able to:

- a. define and use GUI basic controls within simple layout containers,
- b. understand the concepts of event-driven programming.

10. 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
- d. plot simple graphs.

Evaluation

| Course Component | Weight |
|-------------------|--|
| Attendance | 5% |
| Quizzes | 10% |
| Laboratory | 15% (10% Lab assignment + 5% Attendance) |
| Midterm Test | 20% |
| Final Examination | 50% |

To obtain a passing grade in the course, a mark of 50% or more must be achieved on the following course components: the final examination, and the midterm examinations, the quizzes, and the laboratory works. Any component mark < 50% will result in a final course grade of 48% or less.

Attendance: Class attendance will be recorded using the Western Photo ID Card (ONECard), and the attendance-grade will be assigned based on the following breakdown:

| Percentage of Attendance | Weight |
|--------------------------|--------|
| 1 – 30 | 1 |
| 31 – 55 | 2 |
| 56 – 72 | 3 |
| 73 – 89 | 4 |
| 90 and above | 5 |

Laboratory Assignments (Maximum 10):

- The labs schedule will be announced on the course website (OWL).
- The assignment will be available at least one week prior to the lab day.
- You **MUST** submit your source code (.java files only) to OWL course site (electronically) within the announced deadline; zero grade will be assigned (for the 10% lab portion) for not submitting electronically and/or not demonstrating.
- Grades will be assigned based on the submitted working code; zero grade will be assigned for no demonstration even though the working code is submitted.
- Two worst lab grades will be taken out of the lab average.
- The laboratory attendance is mandatory. Note that, the (5%) will be marked separately from the lecture attendance.

Quizzes (Maximum 5):

- The quizzes schedule will be announced on the course website (OWL).
- The quiz questions will be taken from the course components used in the lab-assignment
- On the quiz, the student might be asked to write the lab-code, s/he just submitted.

Midterm Examination: TBD on OWL.

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

Late Submission Policy: No late assignment will be accepted.

Assignment Submission Locker: Locker 233 located on the second floor of TEB.

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.

Attendance: All classes, laboratories, and tutorials are mandatory unless otherwise stated. Any student who, in the opinion of the instructor, is absent too frequently from class, laboratory, or tutorial periods will be reported to the Dean (after due warning has been given). On the recommendation of the department, and with the permission of the Dean, the student will be debarred from taking the regular final examination in the course.

Absence Due to Illness or Other Circumstances: Students should immediately consult with the instructor or department Chair if they have any problems that could affect their performance in the course. Where appropriate, the problems should be documented (see the attached “Instructions for Students Unable to Write Tests or Examinations or Submit Assignments as Scheduled”). The student should seek advice from the instructor or department Chair regarding how best to deal with the problem. Failure to notify the instructor or department Chair immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

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

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.

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.