Description:
This course is intended to give an in depth look at the implementation and test phases of the software construction process. This is a project based course which requires completing a medium scale project at the end of the term. In this project, students will work on a substantial application that allows them to gain hands-on experience on various aspects of software construction. During this course, students will learn to improve their own software development practices as well as improve other aspects of project management such as learning time-management, planning, and quality control.

Topics covered in this course include an introduction to Software development process, basic process models, software specification, introduction to software design, programming language specifics (C#), code review and inspections, testing, building and debugging tools (Unity) and version control (Git). This course will use C# as the language and Unity as the graphics platform.

Instructor: Dr. Katarina Grolinger, P.Eng.
TEB 259, 519-661-2111 ext. 81407, kgroling@uwo.ca
Consultation hours: TBA

Academic Calendar Copy: Provides an in depth look at the implementation and test phases of the software construction process. This project based course provides hands-on experience on various aspects of software construction including practical experience on software construction tool chain, testing and debugging tools as well as change management tools.

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

Antirequisite: None

Prerequisites: Computer Science 1026A/B or ES 1036A/B.

Co-requisite: Computer Science 1037A/B

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 70%, Engineering Design 30%.

Required Textbook: None

Recommended References:


Rob Miles, C# Programming Yellow Book, 2016.


Unity tutorials: https://unity3d.com/learn/tutorials

General Learning Objectives (CEAB Graduate Attributes)

<table>
<thead>
<tr>
<th>Knowledge Base</th>
<th>1/2</th>
<th>Use of Engineering Tools</th>
<th>3/3</th>
<th>Impact on Society and the Environment</th>
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</thead>
<tbody>
<tr>
<td>Problem Analysis</td>
<td>2/2</td>
<td>Individual and Team Work</td>
<td></td>
<td>Ethics and Equity</td>
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<tr>
<td>Investigation</td>
<td></td>
<td>Communication Skills</td>
<td></td>
<td>Economics and Project Management</td>
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<tr>
<td>Design</td>
<td>2/1</td>
<td>Professionalism</td>
<td></td>
<td>Life-Long Learning</td>
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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. **Overview of software development process and basic process models**
   At the end of this section, students will be able to:
   a. Identify at least two process models
   b. Apply one process model to a small-scale problem.

2. **Practical introduction to the Integrated Development Environment (IDE) Unity**
   At the end of this section, students will be able to:
   a. Use the Unity IDE to create a new application (“project” in IDE terminology)
   b. Compile, run and debug a new or existing project.

3. **Change management in software construction**
   At the end of this section, students will be able to:
   a. Identify at least three change management systems
   b. Apply “Git” to track changes within a project
   c. Use the Git within the IDE to manage changes to a project

4. **Advanced topics in C# programming language**
   At the end of this section, students will be able to:
   a. Identify features in C# that make it an object oriented language
   b. Demonstrate these features with small example classes
c. Explain the use of these features in a given application

5. Basics of Graphical User Interfaces (GUI)
   At the end of this section, students will be able to:
   a. Recall basic principles of event driven programming
   b. Modify an existing application to add new GUI components and implement their underlying functionality
   c. Apply the test plan to an actual product and verify its functionality

6. Creating and using software specification documents and test plans
   At the end of this section, students will be able to:
   a. Define a specification for a small-scale problem
   b. Define a test plan to verify whether a product complies with the specifications

7. Introduction to software design
   At the end of this section, students will be able to:
   a. Identify one software design method
   b. Given a small-scale design, construct software modules according to this design.

8. Term Project
   At the end of this section, students will be able to:
   a. Implement a small-scale application on the selected platform.
   b. Test and debug a small application within the selected IDE.
   c. Manage changes in source code as the application is developed.
   d. Validate application against the given specifications

Evaluation

<table>
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<tr>
<th>Course Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Laboratory Assignments</td>
<td>15%</td>
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<tr>
<td>Pop quizzes</td>
<td>10%</td>
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<tr>
<td>Midterm Test</td>
<td>20%</td>
</tr>
<tr>
<td>Term project</td>
<td>55%</td>
</tr>
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To obtain a passing grade in the course, a mark of 50% or more must be achieved in the midterm test, laboratory assignments, and the project. A mark less than 50% in any one of the three components: the midterm test, laboratory assignments, and the project, will result in a final course grade of 48% or less.

**Laboratory Assignments:** This will consist of three laboratory assignments. These will have both an electronic submission as well as a short demonstration in the lab. You must complete both parts to get credit for each assignment

**Pop Quizzes:** This will consist of response to short questions given on random days throughout the term without prior notice
**Midterm Test:** The midterm exam will take place during the regular lecture hours. The test will be closed book (no books, notes, and electronics will be allowed).

**Term Project:** The term project involves developing a complete application in phases. The final deliverable will include a design, source code, test report, and demonstration in the lab. A test report is a self assessment of the project based on a set of tests. Any test item that is marked as 'pass', but fails during the demonstration will be treated as academic dishonesty and will result in the project not being graded.

**Late Submission Policy:** There will be strict deadlines for the assignments and the project. Marks will be deducted for late assignment. 10% (of the available mark) per day will be subtracted for late assignment, to a maximum of 2 days late.

**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:** 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:** 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. 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

**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.