

Western University
Faculty of Engineering
Department of Electrical and Computer Engineering

SE2250 B: Software Construction

Course Outline 2021-22

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 that 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 in 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. Soodeh Nikan
snikan@uwo.ca
Consultation hours: TBD via Zoom (Please sign-up in advance)

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 Engineering Science 1036A/B

Co-requisite: None

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

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

Recommended References:

- Jeremy Gibson Bond, Introduction to Game Design, prototyping, and Development: From Concept to Playable Game with Unity and C#, 2nd edition, Addison-Wesley, 2017. ISBN-13: 978- 0134659862.
- Joseph Albahari and Ben Albahari, C# 7.0 In A Nutshell: The Definitive Reference, O'Reilly Media, 2017. ISBN-13: 978-1491987650.
- Rob Miles, C# Programming Yellow Book, 2019.
- Joe Hocking, Unity in Action: Multiplatform Game Development in C# with Unity 5, Manning Publications, 2015. ISBN-13: 978-1617292323.
- Unity tutorials: <https://unity3d.com/learn/tutorials>

General Learning Objectives (CEAB Graduate Attributes)

| | | | | | |
|------------------|-----|--------------------------|-----|---------------------------------------|-----|
| Knowledge Base | 1/2 | Use of Engineering Tools | 3/3 | Impact on Society and the Environment | |
| Problem Analysis | 2/2 | Individual and Team Work | | Ethics and Equity | |
| Investigation | | Communication Skills | | Economics and Project Management | |
| Design | 2/1 | Professionalism | | Life-Long Learning | 1/2 |

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.

| Course Topics and Specific Learning Outcomes | CEAB Graduate Attributes Indicators |
|---|-------------------------------------|
| <p>1. Overview of software development process and basic process models At the end of this section, students will be able to:</p> <ul style="list-style-type: none"> a. Identify at least two process models. b. Apply one process model to a small-scale problem. | <p>PA1, PA2 PA3</p> |
| <p>2. Practical introduction to the Integrated Development Environment (IDE) Unity At the end of this section, students will be able to:</p> <ul style="list-style-type: none"> a. Use the Unity IDE to create a new application (“project” in IDE terminology). b. Compile, run and debug a new or existing project. | <p>ET2 ET2</p> |

| | |
|---|--|
| <p>3. Change management in software construction</p> <p>At the end of this section, students will be able to:</p> <ul style="list-style-type: none"> 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. | <p>ET1 ET2 ET2</p> |
| <p>4. Advanced topics in C# programming language</p> <p>At the end of this section, students will be able to:</p> <ul style="list-style-type: none"> 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. | <p>ET1 ET2 ET1</p> |
| <p>5. Basics of Graphical User Interfaces (GUI)</p> <p>At the end of this section, students will be able to:</p> <ul style="list-style-type: none"> 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. | <p>D3 D4</p> |
| <p>6. Creating and using software specification documents and test plans</p> <p>At the end of this section, students will be able to:</p> <ul style="list-style-type: none"> a. Define a specification for a small-scale problem. b. Define a test plan to verify whether a product complies with the specifications | <p>PA1 PA2</p> |
| <p>7. Introduction to software design</p> <p>At the end of this section, students will be able to:</p> <ul style="list-style-type: none"> a. Identify one software design method. b. Given a small-scale design, construct software modules according to this design. | <p>D1 D2, D3</p> |
| <p>8. Term Project</p> <p>At the end of this section, students will be able to:</p> <ul style="list-style-type: none"> 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. | <p>PA1, PA2, PA3, D1, D2 ET2 D3 D4</p> |

Evaluation

| Course Component | Weight |
|----------------------------|--------|
| Laboratory Assignments (2) | 20% |
| Quizzes (2) – Online | 5% |
| Midterm Test – Online | 20% |
| Project (3 Phases) | 55% |

To obtain a passing grade in the course, a mark of 50% or more must be achieved on 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.

Online Laboratory Activities: There will be online lab activities every week in which students will implement the covered course material to solve and submit two assignments and three final project's phases online. Assignments and Project will be posted on OWL. Once posted, students can work on it immediately and they can submit their answer anytime during the allowed timeframe until the due date and time as specified in the lecture plan on OWL.

Laboratory Assignments: This will consist of two 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.

Online Quizzes: To help the students follow with the material, there will be up to two quizzes as specified within course plan on OWL. No late submission will be accepted.

Online Midterm Exam: To help the students follow with the material, there will be an online midterm exam as specified within course plan on OWL.

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.

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 rules of etiquette:

- 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
- In order to give us optimum bandwidth and web quality, please turn off your video camera for the entire class unless you are invited to speak
- unless invited by your instructor, do not share your screen in the meeting

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 and turn on your video camera before speaking
- self-identify when speaking.
- remember to mute your mic and turn off your video camera after speaking (unless directed otherwise)

General considerations of “netiquette”:

- 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 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: 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 department will decide whether to provide a make-up test or allow 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.