DALHOUSIE UNIVERSITY
Faculty of Computer Science

CSCI5308 — Advanced Topics In Software Development

Course Syllabus - Summer 2022

Instructor Information

Instructor:	Robert Hawkey	**Office:**	Goldberg 219
E-mail:	rhawkey@dal.ca	**Office Hours:**	Thursdays 14:00-15:00
Class Meeting Time:	Monday and Wednesday 11:05-12:25	**Room No:**	Goldberg 127
Lab Meeting Time:	Wednesday 15:35-16:55	**Room No:**	Goldberg 127
Course Homepage:	Brightspace - https://dal.brightspace.com		
Teaching Assistants:	Adesh Adimurthy ad671703@dal.ca		
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Course Description

Too often in an academic project environment, the code that is produced is functional for correct inputs; but may not be reliable, readable, clean, modifiable, or fully tested. When students enter the workplace, the code they produce becomes fragile and rigid, increasing the costs to maintain and change. This course works to bridge that gap and provide students with the knowledge and skills necessary to write quality production code for team-based programming projects.

The concepts covered in class will be implemented during the group project. First, we will establish an Agile programming environment; including continuous integration with automated builds, deployment, and configuration; and set up source control. Students will then learn to write clean, readable code using S.O.L.I.D principles. Students will be taught the importance of cohesion, and avoidance of coupling. As it is important to be able to build from existing code bases and knowledge, we will discuss how to use design patterns. Other coding practices such as establishing data, business logic and display logic boundaries; and agreeing upon naming standards will be taught. We will also cover refactoring; and test-driven development. Where possible we will include real-world problem descriptions and invite industry professionals to discuss the quality assurance practices in their workplace.

Learning Outcomes

- Understand professional programming in an environment where quality is paramount.
- Understand the importance of integrating quality assurance into programming practices.
- Apply Agile methodology to develop a team-based programming project.
- Apply the appropriate tools to automate builds, deployment and configuration.
- Understand source control strategy and apply source control tools.
- Analyze and apply test driven development to the software project.
- Explain and implement the S.O.L.I.D. principles of object-oriented design (single responsibility, open/closed, Liskov substitution, interface segregation, dependency inversion).
- Understand and implement the principles of cohesion and coupling and avoid their misuse.
- Understand how to write clean, readable code.

- Apply design patterns and analyze the benefits of using existing code / APIs.
- Recognize code smells and analyze how to refactor code to avoid them.
- Understand the importance of establishing boundaries in your systems (i.e. data, business logic, display logic)
- Understand the importance of the consistent application of naming conventions.
- Understand the concept of technical debt and the long-term costs of bad code.
- Analyze and improve existing code through refactoring.
- Identify and address fragility and inflexibility in code.
- Conduct code reviews to improve the quality of a piece of code.

Important Dates

1. Victoria Day - University Closed: May 23, 2022
2. Canada Day - University Closed: July 1, 2022
3. Last day to add/drop courses: May 16, 2022
4. Last day to drop without a "W": May 31, 2022
5. Last day to drop with a "W": June 28, 2022

Deadlines (All items due at 23:59 Atlantic on date specified)		
Assessment	**Due Date**	**Description**
Individual Assignment - TDD	May 22	A programming assignment that assesses your understanding of test-driven development
Group Project Proposal	May 27	A proposal describing the application your group will build
Group Project TA Sign Off	June 3	Work with your TA to have your project approved
Group Project Working CI/CD Pipeline	June 5	By this date your group must have a functional CI/CD pipeline in Gitlab
Group Project Preliminary Class Design **(Optional)**	June 10	An opportunity to receive feedback on your application's class design
Group Project Revised Classes/Architecture **(Optional)**	June 17	An opportunity for your group to receive feedback on your revised class design and architecture
Individual Assignment - S.O.L.I.D.	June 19	A programming assignment that assesses your understanding of the S.O.L.I.D. principles of object-oriented design
Group Project Project Review **(Optional)**	June 30	An opportunity for your group to receive feedback on your project's code quality
Group Project Creational Patterns Plan **(Optional)**	July 8	An opportunity for your group to receive feedback on your plan for the use of creational design patterns
Individual Assignment - Design Patterns	July 17	A programming assignment that assesses your understanding of design patterns
Group Project Demonstration Video	July 26	A video your group records that demonstrates the functionality of your application
Group Project Code	July 26	Submitted through git, the final state of your group project code base

Note: This course has a strict no late submission policy for course deliverables. Late assignments and project submissions are not accepted.

Class Format and Course Communication

- This class will be a flipped classroom:
  - Read about flipped classrooms here: https://cft.vanderbilt.edu/guides-sub-pages/flipping-the-classroom/
  - Students will review online modules and content and work through small quizzes before the lecture on their own time, this work will take approximately 1.5 hours per week. The Brightspace quizzes are not graded, but rather are a tool to help you assess your understanding of the material.
  - Lectures will review and reinforce what you have learned in the self-study modules, I will contextualize the content with examples from industry.
  - Tutorials will feature an in-class quiz, followed by a review of the quiz answers. We will also cover how your group projects will be assessed according to the weekly topic.
- Please note all lectures and labs will be recorded and made available to the TAs and students enrolled in the course via Panopto. Participation in lectures and labs will automatically indicate that you consent to your voice, text or screen sharing being recorded for viewing by those enrolled in or assisting in the delivery of the course.
- Students must ask permission before recording, screen capturing or screen sharing.
- Major course announcements will be posted to Brightspace, which should trigger a notification email to your Dal email account. It is the student's responsibility to check their Dal e-mail on a daily basis. To access your Dal e-mail account please see: `https://www.dal.ca/dept/its/o365/services/email.html`

Asking Questions

My students come from diverse cultural and educational backgrounds. Therefore I would like to clarify my expectations for your approach to learning in my course. When you read material on Brightspace, or during lectures and labs, if you have a question I **always** want you to ask the question and keep asking until you understand the material. There are no time wasting questions, dumb questions or unwanted questions. In fact, sometimes questions lead to some of the best learning opportunities for everyone. The only time questions become problematic is when they are repeated! Often when you have a question many other students have the same question, or they may contribute to your question and ask things you didn't think of. Because of this, the best place to ask questions is during class or the tutorial, or in the **General Channel on Microsoft Teams**.

If you have personal matters to discuss, and you cannot come to my office hours, use Microsoft Bookings to book time to speak with me. You can book a 20-minute meeting directly in my Outlook calendar, subject to my availability. These meetings will be held online using Microsoft Teams. Before booking, be respectful of my time and ensure your matter is truly something that needs to be discussed in private outside of my normally scheduled office hours. You can book time with me here:
https://outlook.office365.com/owa/calendar/FCSRobertHawkey@dalu.onmicrosoft.com/bookings/

Evaluation Criteria

1. Three (3) Assignments (30%)
   - Each assignment carries the same weight (10%)
   - Assignments are submitted online in Brightspace and through an individual git repository created for you on Gitlab.
   - **Late assignments will not be accepted.**
   - **No collaboration is permitted on the assignments.**
   - **All assignments will be checked with plagiarism detection software.**
2. Weekly Quizzes (30%)

- A combination of multiple choice and scenario-based written response questions that test your understanding of the week's topic.
- Weight distributed evenly across all quizzes.
- "Life happens" clause - Your two lowest quiz grades will be dropped.
- **SDAs are not accepted for quizzes because we review quiz answers immediately after.**

3. Group Project (40%)
    - Project Proposal (5%)
    - Working CI/CD Pipeline (5%)
    - Project Demonstration Video (5%)
    - Project Code Assessment (25%)

Notes

- Graduate students must achieve a minimum grade of B- to pass the course.
- Group project work in this course requires an equal contribution from all members of the group. If we determine you did not contribute to your group equally your group project mark will be subject to a grade penalty. Consult the group project document for information on how your contribution is measured. The following penalties apply to the full weight of your group project on your final grade:
    - Underperformed vs. rest of the group: **-15%**
    - Significantly underperformed vs. rest of the group: **-30%**
    - Performed less than half the work of rest of the group: **-50%**
    - Contributed almost nothing: **-90%**
    - No group work/contact: **-100%**
- As graduate students who must achieve a B-, contributing almost nothing and certainly no group work would likely result in failing the course.
- The grade conversion scale in Section 17.1 of the Academic Regulations, **Graduate Calendar** will be used.
- Please read the definition for grade ranges according to Dalhousie's grade scale and definitions here: https://www.dal.ca/campus_life/academic-support/grades-and-student-records/grade-scale-and-definitions.html
- To achieve an A on all assessments in this course you must demonstrate *"originality; outstanding capacity to analyze, synthesize and create; outstanding grasp of the subject matter or demonstrate evidence of an extensive knowledge base on the subject matter"*. Simply achieving a "good enough" assessment or implementation on deliverables in this course earns a B grade for masters students. **Demonstrate your mastery of the subject to earn A's.**

Required Texts and Resources

- There is no required textbook for the course.
- The lecture slides will be posted on the learning management system (Brightspace).
- Content will be delivered entirely through Brightspace modules in the form of readings, videos and small recordings uploaded by the instructor.

Prerequisites

None

Tentative Schedule of Topics

Week	Topic
1	Syllabus, course overview & group project discussion
2	Test-driven development
3	Understanding how Agile methodology contributes to code quality
4	Continuous integration\continuous delivery
5	S.O.L.I.D. principles of object-oriented design
6	S.O.L.I.D. continued
7	Cohesion & coupling
8	Clean code & layer boundaries
9	Creational design patterns
10	Structural design patterns
11	Behavioural design patterns
12	Refactoring

Responsible Computing Policy

Usage of all computing resources in the Faculty of Computer Science must be within the Dalhousie Acceptable Use Policies (http://its.dal.ca/policies/) and the Faculty of Computer Science Responsible Computing Policy. (https://www.cs.dal.ca/downloads/fcs_policy_local.pdf)

Use of Plagiarism Detection Software

All submitted code may be passed through a plagiarism detection software, such as the plagiarism detector embedded in Codio, the Moss Software Similarity Detection System (https://theory.stanford.edu/~aiken/moss/), or similar systems. If a student does not wish to have their assignments passed through plagiarism detection software, they should contact the instructor for an alternative. Please note, that code not passed through plagiarism detection software will necessarily receive closer scrutiny. https://cdn.dal.ca/content/dam/dalhousie/pdf/dept/university_secretariat/policy-repository/OriginalitySoftwarePolicy.pdf

Copyright Notice

Culture of Respect

Every person has a right to respect and safety. We believe inclusiveness is fundamental to education and learning. Misogyny and other disrespectful behaviour in our classrooms, on our campus, on social media, and in our community is unacceptable. As a community, we must stand for equality and hold ourselves to a higher standard.

What we all need to do [1]:

1. **Be Ready to Act:** This starts with promising yourself to speak up to help prevent it from happening again. Whatever it takes, summon your courage to address the issue. Try to approach the issue with open-ended questions like "Why did you say that?" or "How did you develop that belief?"
2. **Identify the Behaviour:** Use reflective listening and avoid labeling, name-calling, or assigning blame to the person. Focus the conversation on the behaviour, not on the person. For example, "The comment you just made sounded racist, is that what you intended?" is a better approach than "You're a racist if you make comments like that."
3. **Appeal to Principles:** This can work well if the person is known to you, like a friend, sibling, or co-worker. For example, "I have always thought of you as a fair-minded person, so it shocks me when I hear you say something like that."
4. **Set Limits:** You cannot control another person's actions, but you can control what happens in your space. Do not be afraid to ask someone "Please do not tell racist jokes in my presence anymore" or state "This classroom is not a place where I allow homophobia to occur." After you have set that expectation, make sure you consistently maintain it.
5. **Find or be an Ally:** Seek out like-minded people that support your views, and help support others in their challenges. Leading by example can be a powerful way to inspire others to do the same.
6. **Be Vigilant:** Change can happen slowly, but do not let this deter you. Stay prepared, keep speaking up, and do not let yourself be silenced.

University Statements

This course is governed by the academic rules and regulations set forth in the University Calendar and the Senate.
https://academiccalendar.dal.ca/Catalog/ViewCatalog.aspx?pageid=viewcatalog&catalogid=69&chapterid=3457&loaduseredits=False

Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity.
http://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of: a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (NS, NB, PEI, NFLD).
http://www.dal.ca/campus_life/student_services/academic-support/accessibility.html

Student Absence Declaration

In January 2018, the Student Declaration of Absence Form was introduced in select courses to re-place sick notes for absences of three days or fewer that result in missed or late academic require-ments.
https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/academic-policies/student-absence.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate,

[1] Source: Speak Up! ©2005 Southern Poverty Law Center. First Printing. This publication was produced by Teaching Tolerance, a project of the Southern Poverty Law Center. Full "Speak Up" document found at: http://www.dal.ca/dept/dalrespect.html Revised by Susan Holmes from a document provided April 2015 by Lyndsay Anderson, Manager, Student Dispute Resolution, Dalhousie University 902.494.4140 lyndsay.anderson@dal.ca www.dal.ca/think.

violations of the code can be resolved in a reasonable and informal manner—perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for formal dispute resolution.
https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/student-life-policies/code-of-student-conduct.html

Diversity and Inclusion —- Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2).
http://www.dal.ca/cultureofrespect.html

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel and support. Visit the office in the McCain Building (room 3037) or contact the programs at elders@dal.ca or 902-494-6803 (leave a message).

Learning and Support Resources

General Academic Support — Advising http://www.dal.ca/campus_life/student_services/academic-support/advising.html

Fair Dealing Guidelines https://libraries.dal.ca/services/copyright-office/guidelines/fair-dealing-guidelines.html

Dalhousie University Library http://libraries.dal.ca