Software Testing and Maintenance (SWE 437/637)

Fall 2024 Course Syllabus

Professor: Brittany Johnson-Matthews (most students call me Dr. B)
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Lab website: https://inspired.cs.gmu.edu/
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Office hours (virtual):
Tuesdays 1:00 – 2:00 pm
(link and password posted on Piazza)

Office hours (in-person):
Thursdays 10:00 am – 11:00 am

TA: TBA
Email:
Office Hours: TBD

Class meeting time: Thu 4:30—7:10 pm
Class location: Exploratory Hall L102

Below are listed my/Mason's usual course policies. However, we are not in "usual" times. I fully understand that each of us may face new obstacles, or old obstacles in novel ways, during this time. Please communicate with me if such things are getting in your way for this class. **My goal is to facilitate your growth and success in this strange and uncertain time;** I can only do that if you tell me what is happening.

Textbooks

Introduction to Software Testing (edition 2), Ammann and Offutt – *Required*
Test Driven: Practical TDD and Acceptance TDD for Java Developers, Koskela – *Provided*

Course Catalog Description

> Concepts and techniques for testing and modifying software in evolving environments. Topics include software testing at the unit, module, subsystem, and system levels;

developer testing; automatic and manual techniques for generating test data; testing concurrent and distributed software; designing and implementing software to increase maintainability and reuse; evaluating software for change; and validating software changes.

Course Learning Outcomes

- Knowledge of quantitative, technical, and practical methods that software engineers and developers can use to test their software
- Testing techniques and criteria for all phases of software development – unit (developer) testing, integration testing, system testing, etc.
- Theoretical and practical knowledge of how to apply test criteria to improve the quality of software
- Knowledge of modern challenges and procedures to update continuously evolving software
- Understanding of best quantitative programming and design practices to ensure software can be efficiently and effectively modified
- Understanding that maintainability and testability are more important than efficiency for almost all modern software projects

Course Content

This course has two closely related themes. First, more than half the effort in software development is devoted to activities related to testing, including test design, execution, and evaluation. This course will teach quantitative, technical, practical methods that software engineers and developers can use to test their software, both during and at the end of development. Second, most software development is not new development, but adding new features, correcting problems, migrating to new platforms, and integrating third-party components into new projects (maintenance & evolution). These two themes are intertwined because much of the effort during maintenance is testing the changes, and much of the effort in testing is about evaluating changes.

This course covers these two themes quantitatively, with a solid basis in theory and with practical applications. These topics are useful to strong programmers in the Computer Science program, as well as engineers, physical scientists, and mathematicians who regularly integrate software components as part of their work.

Prerequisites

While this course provides extremely practical skills, it is, at heart, an applied math course. We will generate tests from mathematical models of the software using structures from ***discrete math*** (sets, graphs, logic, and grammars). We will use examples from ***data structures*** and require tests to be implemented in JUnit.

Office Hours & Availability

Office hours are times that I commit to being available (virtually or in-person), first-come first-served. You do not need an appointment and I'm available to talk during these hours about *anything* (course related or otherwise).

If you can't make my office hours, I'm happy to make appointments. I will tell the class if I miss office hours. I may also post availability from time-to-time for virtual homework help and test prep (along with virtual office hours, if my office hours don't work for your schedule).

Safe Space Policy

My classroom and my office (virtual or otherwise) are safe spaces. There is a lot going on in the world right now, and I want to make sure that you all feel comfortable and accommodated in every way. There is a ZERO TOLERANCE policy for disrespectful, racial, or otherwise prejudicial statements or actions in my class or office. If at any time you feel uncomfortable with something that has been said or done (by me or another student), please do not hesitate to contact me.

Using ChatGPT

We are all aware of the widespread adoption of ChatGPT amongst students and professors. **Please use these technologies with caution, especially on graded assignments**. I encourage the use of technologies that support successful learning, however, the ground truth for this course is in the lectures and readings. If your submissions contradict the expectations of the course, you will be graded accordingly regardless of where you got help with your answers.

Some general advice if using ChatGPT to support learning:

- **Understand the foundations first**; ChatGPT is much more effective when given detailed, accurate prompts.
- **Use in combination with the course material** so you can effectively double check any information it provides you.

- **Avoid asking for answers or solutions**; ChatGPT can be confidently wrong (which again emphasizes the importance of foundations when using it).

Readings

I expect you to read the relevant material **before** class meetings. The lectures may not cover all material from the readings and will often include material not found in the readings. So both reading and attending are important to your success in this class.

Graded Assignments

We will have graded assignments for most topics. They will be posted on the class website and any clarifications or hints on Piazza.

Assignments must be submitted by the beginning of the class on the day they are due to be counted as on time. Late submissions will receive **30% per week** deduction. Per GMU policy, all assignments must be submitted **before** the beginning of final exams.

Collaboration

You can work on assignments individually if you prefer. However, not only is collaboration how real software is built, but it's also the best way to learn (and more fun!). Therefore, collaborative assignments will receive a **5% bonus credit**.

If you work collaboratively, list every collaborator and include **a short summary of what each person did** (*collaboration summary*). You can submit one assignment with multiple names or work together to analyze the problem and develop the solution, then complete the assignment separately.

You can collaborate in teams of up to **three** students but **only other students in SWE 437/637 this semester**. You are **NOT ALLOWED** to include "guest names". Every person listed as a collaborator **must contribute**.

If someone is listed as a collaborator but did not contribute, all will be given a zero on the assignment and reported to the university honor committee. ***So please be honest and collaborative when completing your assignments!*** If you have any questions or concerns while completing an assignment, don't hesitate to contact me or the GTA.

Quizzes

We will have weekly quizzes instead of a midterm exam. Quizzes will be given in the first 10-15 minutes of class and will cover material from the previous class meeting and the reading assigned for that day.

In-class Exercises

We will have in-class assignments during most classes. Some will be done as a class, some will be done in small groups, and a few may be individual exercises. They count towards your participation grade and will be announced and distributed during class. Important: Credit can only be received if done in class, although if you miss class, you should do the posted in-class assignments on your own to prepare for the quizzes and final exam.

Extra Credit Opportunities

Throughout the semester, I will provide random opportunities for extra credit. These will typically take the form of extra practice problems, but I may also include fun extra credit opportunities (e.g., wear your Halloween costume to class). Extra credit will be applied *at the end of the semester* such that it provides the most benefit towards your final grade.

Discussion Board Use

All students will be enrolled in the discussion forum for SWE 437/637 on Piazza. You will receive an invitation via your Mason email. Participation on Piazza will count towards your participation grade. Ask all technical questions about the material or the assignments on Piazza. You can also post about software failures, errors in the books or slides, or about topics that extend from our classroom discussion.

Participation and Attendance

You are not required to attend class. However, do keep in mind that your participation grade is 15% of your final grade. So not attending class means finding other ways to ensure you get full credit for participation (e.g., participations on Piazza). If you miss class, you are responsible for catching up on any material missed.

Email Communications

I will frequently send course announcements to your Mason email account (via Piazza), so you should check it regularly. Professors are required to use your Mason email, not personal email accounts. Email sent to the professor or TA should have a subject that starts with "SWE 437/637". If not, we may not notice it in a timely manner.

Questions about the technical material and class policies should be posted on Piazza or addressed during office hours, not sent through email.

Online Presence

I always accept LinkedIn requests from current and former students – we clearly have a professional relationship. *Be sure to remind me you took my class*. I tweet random thoughts super irregularly about software engineering and life @drbrittjay @inspiredlabgmu

Diversity, Inclusion, & Anti-Racism Statement

As a member of the George Mason University community, I will work to create an educational environment that is committed to anti-racism and inclusive excellence. An anti-racist approach to higher education acknowledges the ways that individual, interpersonal, institutional, and structural manifestations of racism against Black individuals, indigenous people, and other people of color contribute to inequality and injustice in our classrooms, on our campuses, and in our communities. Anti-racist work strives to provide our community members with resources to interrupt cycles of racism so as to cultivate a more equitable, inclusive, and just environment for all of our students, staff, faculty, alumni, and friends, regardless of racial background. I believe that the work of anti-racism starts with each individual; together, students and faculty in this course will build knowledge and take actions rooted in principles of equity, inclusion, and justice that we will carry with us throughout our lives.

Statement of Collegiate Compassion

I believe we learn best when we can show up as whole and healthy people. To learn effectively we need to have basic security: a roof over our head, a safe place to sleep, a stable place to live, and enough food to eat. If you are struggling to meet any of these basic needs please talk to me, visit our campus food pantry (https://ssac.gmu.edu/patriot-pantry/), or reach out to other Mason resources https://learningservices.gmu.edu/campus-resources/. Remember, asking for assistance and advocating for yourself is an important part of your collegiate experience. I am here to help, and YOU are not alone.

Honor Code Statement

As with all GMU courses, SWE 437 is governed by the GMU Honor Code. In this course, **all** quizzes and exams carry with them an implicit statement that it is the sole work of the author, unless joint work is explicitly authorized. When joint work is

authorized, all contributing students must be listed on the submission. Any deviation from this is considered an Honor Code violation, and as a minimum, will result in failure of the submission and as a maximum, **failure of the class**.

Office of Disability Services

If you need academic accommodations, please see me and contact the Disability Resource Center(DRC) at 993-2474. All academic accommodations must be arranged through the DRC.

Other Useful Campus Resources

- Student Support and Advocacy Group: https://ssac.gmu.edu/
- Office of Diversity, Inclusion, and Multicultural Education (ODIME): https://odime.gmu.edu/
- Writing Center: A114 Robinson Hall; (703) 993-1200; http://writingcenter.gmu.edu
- University Libraries "Ask a Librarian"; http://library.gmu.edu/ask
- Counseling and Psychological Services (CAPS): (703) 993-2380; http://caps.gmu.edu

Grade Distribution

Participation (discussion board and in-class): 15%
Assignments: 20%
Quizzes: 30%
Final exam: 35%

Numeric scores will map to letter grades as follows:

97+:	A+
90-96:	A
85-89:	B+
80-84:	B
70-79:	C
below 70:	F

I delegate quiz and assignment grading to our GTA, and I provide specific grading guidelines. If you have questions about your grade, or if you feel that your work has not been graded correctly based on the grading guidance, then please contact our GTA

first. They can probably answer your question or correct any obvious mistakes quickly and easily. If you do not feel that our GTA has adequately addressed your concerns, please contact me. I will consider your concerns and re-grade your work. But understand that while my re-grading might result in a higher grade, it might also result in a lower one.