Course Syllabus
SWE 637 Software Testing (3 Credits)
Section 001, Spring 2020

Instructor: Dr. Bob Kurtz, Adjunct Professor, rkurtz2@gmu.edu

GTA: David Gonzalez, dgonza10@gmu.edu

Schedule: Thursday 4:30pm – 7:10pm

Location: Buchanan Hall D023

Course Description:

Students learn to test software effectively. Programmers learn practical ways to design high quality tests during all phases of software development. Students learn the theory behind criteria-based test design and to apply that theory in practice. Topics include test design, test automation, test coverage criteria, and how to test software in cutting-edge software development environments.

Textbook: *Introduction to Software Testing*, 2nd Edition, Paul Ammann and Jeff Offutt, Cambridge University Press, ISBN 9781107172012 (required)
At the GMU bookstore
Book Website: https://cs.gmu.edu/~offutt/softwaretest/

Prerequisites: SWE 619 is required. While this course provides extremely practical skills, it is, at heart, an applied math course. You will need knowledge of discrete math, programming, data structures and basic software engineering. Most examples will be in Java and many assignments will require JUnit tests.

Office Hours: As an adjunct, I do not keep regular on-campus office hours. I'm happy to have discussions after class, and if you need a more in-depth discussion we can set up an appointment. GTA office hours are TBD.

Grading: Grade totals are computed based on:

Quizzes:	40%
Final exam:	30%
Assignments:	20%
Class/online participation:	10%

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

Grades are not "on a curve"; I expect you to demonstrate mastery of the material. However, I may relax the grading scale if the class-wide results of one or more graded works suggest that I set unreasonable expectations.

Attendance: I do not take attendance in class. As graduate students, I expect you to decide how to best use your time and how to balance your school and work commitments. You may come late, leave early, or miss class at your discretion as long as you are not disturbing the other students. However, you remain responsible for understanding the assigned material, and I encourage you to take full advantage of the lectures and in-class exercises to maximize your learning results.

Quizzes: Most classes will have a short quiz at the beginning of class. Quizzes must be taken individually and without written or electronic help. Quiz topics will be taken from course material from one or more previous sessions as well as prior in-class exercises. Each quiz is graded on a 10-point scale, and quizzes may have a bonus question to allow you to demonstrate in-depth understanding. There will not be a midterm exam.

Missed quizzes: You may miss up to three quizzes without penalty. If you complete all quizzes, I will drop your three quizzes with the lowest scores.

Make-ups: You can make-up up to two quizzes due to absences from class. Quizzes can be made up during GTA office hours for two weeks after the original quiz date or by the start of the reading/study period, whichever comes first. Make-up quizzes may have different questions but will have the same general topics as the original. Make-up quizzes will not have a bonus question. Please let me and the GTA know by email if you would like to make up a quiz. I understand that work and personal commitments are not always completely under our control, so if legitimate reasons prevent you from attending class and taking a quiz, please contact me by email before (or as soon as possible after) class.

Final Exam: The final exam will be held during the University-scheduled exam period. The final exam will be closed-book and may contain content from any portion of the course, with a focus on material from quizzes and in-class exercises. University policy specifies that missing the final exam without previous notice is an

automatic F grade. If you can not make it to class for the final exam, please coordinate with me before the exam.

Assignments: There will be several homework assignments. Assignments can be turned in at the beginning of class or submitted by email or Blackboard before the start time of the class. Assignments may be done collaboratively with other students. Collaborative work must list all the contributors with a brief description of each student's contribution, and every person in the group will earn the same grade. Online discussion of assignments is welcome! Late assignments will be reduced in score by 50% for up to two weeks after the original due date or the final exam day, whichever comes first. After that assignments will be given a score of zero.

In-Class Exercises:

Most classes will have an in-class exercise. You are encouraged to work the exercises in collaboration with other students. In-class exercises are not graded but are often related to the quiz the following week.

Class/Online Participation:

In addition to in-class discussion, we will use Blackboard for online discussion. Participation in both environments counts toward your grade. I expect you to ask or post questions and contribute answers about assignments, quiz preparation, or other discussion. I also expect you to participate in discussions during the in-class exercises.

Class Meeting Schedule:

The following class schedule is notional and subject to change as the class progresses. Lecture slides and quiz reviews will be posted to Blackboard; the links provided here are to materials from previous offerings of the class and may be updated as the class progresses. Note that students are expected to have read the assigned chapters *before* the class meeting in order to be prepared for class.

Week #	Date	Topic	Text Chapter	Quiz Prep	Asmt Due	In-Class Exercise	Dr. Ammann's ShowMe
1	1/23	Class Overview; Why Test? Faults, Failures, Errors	1			Wk1 Ex	
2	1/30	The RIPR Model; Model-Driven Test Design	2	Wk2 Quiz	Asmt 1	Wk2 Ex	Faults, Errors, Failures
3	2/6	Test Automation: JUnit	3.1-3.3	Wk3 Quiz		Wk3 Ex	JUnit Theories
4	2/13	Test Doubles; Putting Testing First; Coverage Criteria	12.2 4 5	Wk4 Quiz	Asmt 2	Wk4 Ex	Test Doubles
5	2/20	Input Space Partitioning	6.1-6.3	Wk5 Quiz		Wk5 Ex	
6	2/27	More Input Space Partitioning	6.4	Wk6 Quiz	Asmt 3	Wk6 Ex	Iterator IDM Example
7	3/5	Graph Coverage	7.1-7.2	Wk7 Quiz		Wk7 Ex	
n/a	3/12	Spring Break					
8	3/19	More Graph Coverage	7.3 7.4-7.6	Wk8 Quiz	Asmt 4	Wk8 Ex	
9	3/26	Semantic Logic Coverage	8.1	Wk9 Quiz		Wk9 Ex	ACC ICC DeterminationA DeterminationK
10	4/2	Syntactic Logic Coverage	8.2	Wk10 Quiz		Wk10 Ex	
11	4/9	Applying Logic Criteria	8.3	Wk11 Quiz	Asmt 5	Wk11 Ex	CUTPNFP
12	4/16	Syntax-Based Testing	9.1-9.2	Wk12 Quiz		Wk12 Ex	
13	4/23	Mutation Testing in Practice; Input Syntax Testing	Paper	Wk13 Quiz	Asmt 6	Wk13 Ex	
14	4/30	Course Wrap-Up	Exam Notes				
15	**5/7**	**Final Exam (normal place and time)**					

In-Class Communication:

Laptops, tablets, and other electronic devices may be used in class for class purposes. However, phone calls, text messages, emails, web browsing, and other non-course-related activities are disruptive to other students. Please be considerate in class and do not distract others. If you receive a call or message that you must respond to immediately, please quietly leave the room. Misuse of electronic devices in class will impact your participation grade.

Disability Accommodation:

Disability Services at George Mason University is committed to providing equitable access to learning opportunities for all students by upholding the laws that ensure equal treatment of people with disabilities. If you are seeking accommodations for this class, please first visit http://ds.gmu.edu/ for detailed information about the Disability Services registration process. Then please discuss your approved accommodations with me. Disability Services is located in Student Union Building I (SUB I), Suite 2500. Email: ods@gmu.edu, phone: (703) 993-2474.

Honor Code: Mason is an Honor Code university; please see the Office for Academic Integrity for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. In this course, quizzes and the final exam must be exclusively your own work. Homework assignments that are done in collaboration with other students must give appropriate credit for the work of each student. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

Discrimination:

George Mason University is committed to providing equal opportunity and an educational and work environment free from any discrimination on the basis of race, color, religion, national origin, sex, disability, veteran status, sexual orientation, gender identity, age, marital status, pregnancy status or genetic information. George Mason University shall adhere to all applicable state and federal equal opportunity/affirmative action statutes and regulations.

The University is dedicated to ensuring access, fairness and equity for minorities, women, individuals with disabilities, and veterans (as covered by law) in its educational programs, related activities and employment. George Mason University shall thus maintain a continuing affirmative action program to identify and eliminate discriminatory practices in every phase of university operations.

Students shall interact in class and online with respect for other students, faculty, and staff.

About the Instructor

I'm a Senior Principal Software Engineer at Raytheon with more than 30 years of experience in software design, implementation, and testing with a background in real-time embedded systems, command and control systems, and intelligence collection and management systems. I have a PhD in Information Technology from GMU (2018), an MS in Software Systems Engineering from GMU (2000), and a BS in Computer Science from SUNY Empire State College (1991). My PhD dissertation, *Improving Mutation Testing with Dominator Mutants*, examined the use of machine learning to reduce the overhead of mutation testing. My publications and associated presentations are available at my personal website.

Outside of work and school, I enjoy boating and training, playing, and hunting with my dogs, two Golden Retrievers and a Flat-Coated Retriever.