

Software Testing for Continuous Delivery

CIS 4930 Section 29E3

Class Periods:

Mon, Wed, Fri | Period 7 | 1:55pm - 2:45pm

Location: CSE E222**Academic Term:** Fall 2019**Instructor:**

Byron J. Williams
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352-294-1017

“It is the one who does the work that does the learning”

–Terry Doyle

Office Hours: Monday & Wednesday, 2:50-3:50pm, Materials Engineering Building (MAE) 205B

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

Please contact through the Canvas website

- Lokesh Paluri, lpaluri@ufl.edu, CSE E309, Tuesday: Period 4 (10:40-11:30); Thursday: Period 4-5 (10:40-12:35pm)

Course Description

Software testing is the execution of software and evaluation of the results. One goal of this quality assurance activity is often to identify defects and other irregularities that may impact software users. Quality assurance is verifying that the correct software system is being built for its stakeholders while validating that it functions as designed. In order to produce quality software systems, testing strategies that balance costs and desired quality are required. Automation has become a central component of software quality assurance. As organizations rapidly improve their software systems for their stakeholders (due to adding new feature or bug fixes), automated tools are used to expedite the process while ensuring quality. Automated testing enables continuous deployment by using continuous integration systems that manage the software tests and other quality assurance activities (e.g., static analysis). This course will cover developing a deployment pipeline built on automated tests.

Course Pre-Requisites / Co-Requisites

Senior Standing unless approved by instructor

Course Outcomes & Objectives

This course will provide theoretical and practical experience with various quality assurance activities including testing, code review, static analysis tools focused on developing an automated deployment pipeline. Students will learn how to identify and conduct various types of testing activities for both waterfall and agile processes. This course will also focus on applying various testing / QA tools to simulate a production development process using a test-first design. These objectives will be evaluated with both in-class and take-home assignments, quizzes, a final exam, and group projects.

The course will:

- Provide an introduction to the software engineering testing process
- Describe the quality assurance process and its role in software development

The Student will:

- be instructed in a variety of testing techniques, methods, and tools
- be able to describe the state of practice for verification and validation techniques
- demonstrate proficiency in automating tests using continuous integration
- develop a deployment pipeline to automate release of software to testing, staging, and production environments using local and remote virtual infrastructure
- apply tools / techniques used for software development operations (DevOps) including virtualization, containers, monitoring.

Professional Component (ABET):

The following lists the contribution of the course to meeting the professional components of the ABET-accredited degree.

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1. An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics.	Medium
2. An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs.	Low
3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	High
4. An ability to communicate effectively with a range of audiences	Low
5. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	
6. An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this knowledge appropriately.	High
7. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty	High

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Required Textbooks and Software

Notes derived from literature sources will be presented in class (lecture slides). Required readings from various sources (academic literature, magazines, blog posts) will be announced in class and posted on Canvas.

Students will be required to setup and configure open-source and proprietary software tools on their personal workstations to complete assignments (e.g., Git, Docker, SpotBugs, Vagrant, Cypress/Selenium, Google Cloud SDK, etc.). Students will also be provided with Google Cloud Platform computing credits to setup remote servers to run application code. You will also use other cloud services as part of your continuous integration pipeline (e.g., Travis CI, Bitbucket, Github, Coveralls etc). You will be required to review online documentation to setup and configure tooling in this course.

Recommended Materials

- Paul C. Jorgensen, *Software Testing: A Craftsman's Approach*, Auerbach Publications; 4 edition (October 2013).
- Janet Gregory and Lisa Crispin, *The Agile Testing Collection {Agile Testing | More Agile Testing}*, Addison-Wesley Signature Series (Cohn)
- Alexander Tarlinder, *Developer Testing: Building Quality into Software*, Addison-Wesley Signature Series (Cohn)

Communication & Email Policy

All email communication, especially questions about grading and assignments should be done via Canvas messaging. Course announcements will be made via Canvas (and UF email list-serve). Any other emails should be sent to byron@cise.ufl.edu from student .ufl email accounts. For cloud services used in the course (e.g., Github, Bitbucket) students will invite the professor using his professional email account for those services: me@drbyron.io

Course Schedule

The following unordered lists of topics will be covered in the course. Assigned reading, related lectures slides / notes, and dates will be posted to Canvas.

Developer Testing

- * Agile testing
- * Testability
- * Test-driven development (+BDD)
- * Unit tests
- * Integration tests
- * Acceptance tests
- * Mocks

Software Testing

- * Test plans
- * Regression tests
- * Penetration tests
- * Performance testing
- * Fuzz testing
- * Usability testing & A/B Tests
- * Statistical testing
- * Exploratory testing
- * Smoke testing
- * Test coverage
- * Reliability

Development Operations

- * Test automation
- * Continuous integration
- * Test harnesses
- * Site reliability engineering
- * Continuous deployment / delivery
- * Operational profiles

Testing theory

- * Formal models
- * Partition testing
- * Boundary value analysis
- * State-transition testing
- * Control-flow graphs / testing

Quality Assurance

- * Code reviews
- * Static analysis
- * Software metrics
- * Code smells
- * Technical debt

* plus additional sub-topics related to what's listed above

Attendance Policy, Class Expectations, and Make-Up Policy

Class attendance is mandatory. Attendance will be tracked using roll call, quizzes, and in-class assignments. If an in-class assignment or quiz is missed due to an unexcused absence, it cannot be made up. Quizzes may be given during any class period and will consist of multiple formats (e.g., short answer questions, multiple choice, etc.). Quizzes will evaluate material covered in prior lectures and assigned reading. Assignments and project milestones are assessed a 10% per day late penalty, with a maximum of 4 days. Students with legitimate reasons who contact the professor ***before the deadline*** may apply for an extension. Excused absences must be consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation. It is your responsibility to contact the professor to make up work missed due to an excused absence when you return to class. More than 3 unexcused absences will negatively impact quiz grades (deduction of percentage points [1-2] off the final grade for each absence). There will be some activities assigned (e.g., readings, videos, quizzes, project milestone work) when the professor will be out due to travel or other University commitments. These occurrences will be announced on Canvas.

Attendance is a reflection on your professionalism. Each class is a professional appointment that you have with the instructor and your classmates. If you cannot make an appointment, then the professional thing to do is to cancel the appointment in advance. Please notify Dr. Williams of the circumstances for each absence/tardiness by email prior to class. No excused absences will be given without advanced noticed (certain exceptions apply). Please do so via Canvas messaging.

Evaluation of Grades

Assignment	Percentage of Final Grade
Professional Practice Assignments	50%
Quizzes and In-Class Assignments	25%
Final Exam (12/12/2019 @ 10:00 AM - 12:00 PM)	25%
	100%

Professional Practice: Students will complete individual and group projects to apply the skills learned in the course. The projects will consist of writing tests and code, using quality assurance tools, evaluating software, setting up remote services, writing a blog post etc. All professional practice assignments are due at midnight on the due date.

Exams: There will be 1 final exam given in the course. The final exam will be comprehensive. **Final Exam: Thursday, December 12, 2019 @ 10:00 AM - 12:00 PM**

Quizzes & In-class Assignments: As stated above, quizzes may be given during any class period. In-class assignments will be used to practically assess topics covered by requiring students to implement lessons learned, install and configure applications / services, and collaborate on assigned challenges. These in-class assignments will be started in class (some will be submitted prior to the end of class) and with *some* class time to finish the work.

Grading Policy

The following grade scale will be used to assign final grades. There will be no rounding up (i.e., a final score of 93.3 is an A-)

Percent	Grade	Grade Points
93.4 - 100	A	4.00
90.0 - 93.3	A-	3.67
86.7 - 89.9	B+	3.33
83.4 - 86.6	B	3.00
80.0 - 83.3	B-	2.67
76.7 - 79.9	C+	2.33
73.4 - 76.6	C	2.00
70.0 - 73.3	C-	1.67
66.7 - 69.9	D+	1.33
63.4 - 66.6	D	1.00
60.0 - 63.3	D-	0.67
0 - 59.9	E	0.00

More information on UF grading policy may be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

Instructor Office Location for Office Hours and Scheduled Appointments



Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

University Honesty Policy

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind, please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

Sexual Assault Recovery Services (SARS)

Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. <https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.