

Software Testing for Continuous Delivery

CIS 4930 Section 197A

Class Periods:

Mon, Wed, Fri | Period 3 | 9:35am - 10:25am

Location: Virtual (Zoom, YouTube, Google Meet)

Academic Term: Fall 2020

Instructor:

Byron J. Williams, Ph.D.

byron@cise.ufl.edu

352-294-1017 → Classroom Slack (drbyron.slack.com) - Voice & Messaging

Office Hours: Monday & Wednesday, 10:30-11:30pm, Zoom - <https://ufl.zoom.us/my/drbyronw> - others by appointment

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

–Terry Doyle

Teaching Assistant:

Please contact through the Canvas website

- Anurag Yadav, anuragswar.yadav@ufl.edu, Virtual Office Hours, Friday: Period 3 (9:35-10:25)

Course Description

Software testing is the execution of software and the evaluation of the results. One goal of this quality assurance activity is to identify defects and other irregularities that may impact 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 (e.g., adding new features, bug fixes, etc.), 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 builds, tests, and other quality assurance activities (e.g., static analysis).

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, and static analysis tools with a focus 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-session and take-home assignments, quizzes, writing assignments, 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
- Cover steps required to create an automated deployment pipeline for continuous delivery

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.

This course will treat both software (developer) testing and continuous delivery as ‘first-class’ topics (automated testing enables continuous delivery) with a general theme addressing DevOps (i.e., this is not just a testing course - we will cover automated testing theory and practice and development operations).

Required Textbooks and Software

Notes derived from literature sources will be presented during in-session and pre-recorded lecture and demos. Required readings from various sources (academic literature, magazines, blog posts) will also be given.

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 and services (e.g., Firestore, MongoDB, Redis). Students will also use other cloud services as part of the continuous integration pipeline (e.g., Travis CI, Bitbucket, Github, Coveralls etc). The student will be required to review online documentation to setup and configure tooling in this course.

Honorlock (<https://honorlock.com/>) will be used for all quizzes. The student is required to install the Honorlock Chrome extension and meet the Honorlock system requirements. Review the following guide for more information: <https://dce.ufl.edu/media/dceufledu/pdfs/Honorlock-Student-Exam-Preparation-Information.pdf>

Adapted Materials *(Slides, notes, lecture material adapted from the following)*

- 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)
- Jez Humble, David Farley, Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation; 1st Edition (2010)

Communication & Email Policy

All email / messaging 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). We will use **Slack** (<https://slack.com/>) for all other course messaging with a central channel for discussion and questions about course content and assignments (with the option to create specific channels for assignments / topics). For cloud services used in the course (e.g., Github, Google Cloud) students will invite the professor using his professional email account and/or username as required.

Email: me@drbyron.io Username: **drbyronw**

Virtual Classroom & Course Pedagogy

Our class will meet using the Zoom online conference system. Our success as an online class will depend on the same commitment we all bring to the physical classroom. We will adopt the same rules and norms (take notes; participate by asking and answering questions; wear classroom-ready clothing). For everyone's benefit, join the course in a quiet place whenever possible. Turn on your video whenever possible. Mute your microphone unless you are speaking. Close browser tabs not required for participating in class.

Self-discovery is an important aspect of learning as a computer scientist. In this course you will be required to "learn on your own" certain tools / technology used throughout the course. There will be demos to help get started, but students will be required to review documentation, perform Google searches, examine Stack Overflow (<https://stackoverflow.com/>), watch YouTube videos, etc to setup tooling, configure environments, and use language specific libraries to complete the assignments given.

Material will be covered using a mix of pedagogical methods (problem-first, flipped classes [pre-recorded lecture with in-session assignments], in-session lectures with discussion, polls, group breakout-rooms with assigned tasks, assigned readings etc. Expect a mix of delivery methods during the M/W sessions with Fridays focused on applying lessons learned with hands-on practice. Please use "Raise Hand"

feature and live feedback when appropriate.

Course Topics

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

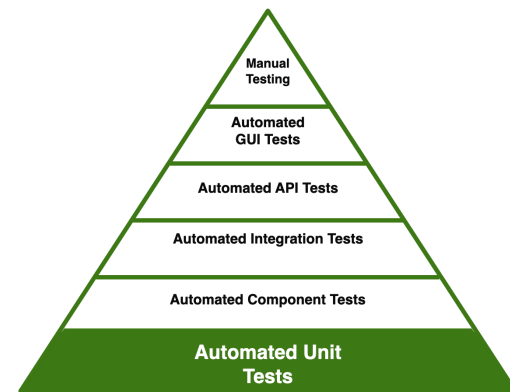
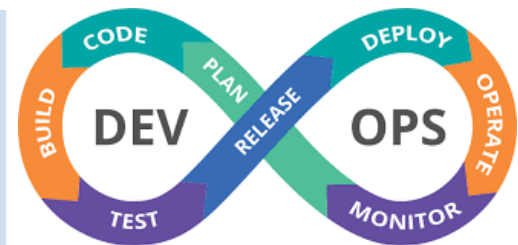
- * Test automation
- * Continuous integration
- * Test harnesses
- * Site reliability engineering
- * Continuous deployment / delivery
- * Operational profiles

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

Synchronous class/session (i.e., instructor & students present at same time / live feedback) attendance is required. Attendance will be tracked using the Zoom attendee list. You must register for Zoom. Do not share your Zoom registration link. Be sure your first name (or nickname) and last name are used on your Zoom screen. You are requested to turn on your video but doing so is not mandatory (strongly recommended for breakout-room sessions and group reporting). If there are times where you choose to not use video please add a photo in place of the live content (Bitmoji's and other cartoon like representations of your image are welcome). Synchronous sessions will be held during the Monday and Wednesday time periods. The Friday period is assigned as TA office hours and time allotted for asynchronous review of assigned material (e.g., pre-recorded lectures, demos, assigned readings, etc) and hands-on practice assignments.

If an in-session assignment or quiz is missed due to an unexcused absence, it cannot be made up. Quizzes may be given during any synchronous session and may contain questions of multiple formats (e.g., short answer, multiple choice, etc.). Quizzes will evaluate material covered in prior sessions, lectures, demos, and assigned reading. Assignments and project milestones will be assessed a 10% per day late penalty, with a maximum of 4 days late for acceptance (unless otherwise specified). Students with legitimate reasons who contact the professor ***before the deadline*** may request a no-penalty 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.

Attendance is a reflection on your professionalism. Each synchronous session 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 before each absence/tardiness by Canvas 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, In-Session Assignments, & Participation	20%
Writing Assignments	30%
	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, the builds to a semester capstone project. All professional practice assignments are **due by midnight on the due date**.

Quizzes, In-session Assignments, & Participation: As stated above, quizzes may be given during any class period. Quizzes may also be assigned. In-session assignments (grade/no-grade) will be used to practically assess topics covered. In-session tasks may include: install and configure applications / services, collaborate on assigned challenges, group discussion posts etc. These in-session assignments will be started in session (some may be submitted prior to the end of the session). Incomplete work can be completed outside of the class period. Due dates for all assignment will be given. Participation assessment includes contributions in-session and via Slack (i.e., responding to peer questions on material) and attendance (penalties begin after 3 unexcused absences).

Writing Assignments: Students will complete professional writing tasks including an opinionated blog post, "how-to" document describing the use of a particular technology to complete a tasks, and a final Experience Report.

Grading Policy

The following grade scale will be used to assign final grades (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>

Virtual Course with Live Recordings and Recorded Material

Our class sessions **may be** audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

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	Medium
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.	Low
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.

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>.