



Software Reliability & Testing

CIS*4150*01

Fall-2022

Course Details

This course introduces systematic testing and verification methods, covering a range of static and dynamic techniques and their use in software development. Concepts such as defining necessary reliability, developing operational profiles, plans to improve and predict software reliability, preparing and executing tests, black box testing, white box testing, unit testing, system testing, and integration testing will be explained.

Department(s): School of Computer Science

Credits: 0.5

Requisites: 1 of CIS*3750, CIS*3760, ENGG*4450 - Must be completed before taking this course.

Locations: Guelph

Method of Delivery: In-class

Offered: Fall Only, All Years

Lecture Schedule

Monday/Wednesday: 8:30 AM - 9:20 AM (9/8/2022 - 12/16/2022)
Guelph, Macdonald Institute (MINS) 300

Lab Schedule

Friday: 11:30 AM - 1:20 PM (9/8/2022 - 12/16/2022)
Guelph, THRN 1307

Midterm Examination

Monday: 8:30 AM - 9:20 AM (Oct. 24, 2022)

During Class hours, Guelph

Guelph, Macdonald Institute (MINS) 300

Final Examination

Monday: 8:30 AM - 10:30 AM (12/12/2022 - 12/12/2022)

TBD, Guelph

Note: See the Assessments section for important information about accessing the final exam. You must be in the exam environment before the scheduled start time.

Instructional Support**Instructor**

Akshay Chadha

Email: chadhaa@uoguelph.ca

Sessional Lecturer Office hours

Monday 10:00-11:00 AM, REY 0004

Course Email

cis4150@socs.uoguelph.ca

Teaching Assistant

Bo Huang, bhuang06@uoguelph.ca

Mustafa Al-Obaidi, malobaid@uoguelph.ca

Farhan Chowdhury, fchowd03@uoguelph.ca

TA Office Hours

Friday: 10:00-11:00 AM, Reynolds-003 or Microsoft Teams (Please contact: Bo Huang, bhuang06@uoguelph.ca)

Learning Resources**Software Testing, Principles and Practices**

ASIN: 0199465878

Publisher: OXFORD UNIVERSITY PRESS (Feb. 1, 2010)

Language: English

ISBN-10: 9780199465873

ISBN-13: 978-0199465873

Author: Naresh Chauhan

Statistical Reliability Engineering: Methods, Models and Applications

Part of: Springer Series in Reliability Engineering

Editor: Hoang Pham

ISBN : 1-84628-295-0

OCLC : (OCoLC)1079006749

ISBN : 1-84996-971-X

ISBN : 1-85233-950-0

Software Reliability Modeling: Fundamentals and Applications

Author: Yamada, Shigeru

ISBN: 4431545646

ISBN: 9784431545644

EISBN: 4431545654

EISBN: 9784431545651

OCLC: 863823010

* Self-learning from open resources.

Course Website

CourseLink (powered by D2L's Brightspace) is the course website and will act as your classroom. You must log in to your course website daily to check for announcements, access course materials, and review the weekly schedule and assignment requirements.
<https://courselink.uoguelph.ca>

Learning Outcomes

Course Learning Outcomes

Today, information is the most valuable commodity in the world. Those who can create, interpret, manipulate, and extract useful information from the mountains of existing data have influence and power. By the end of this course, you should be able to:

1. Identify, articulate, discuss and describe essential details about the software testing and software reliability;
2. Identify and discuss primary testing methods;
3. Design and develop test cases using the available tools;
4. Discuss and explain the social, ethical, and legal issues associated with software testing and its applications with emerging technologies;
5. Explain how to evaluate the quality of programs for their accuracy and reliability; and

Teaching and Learning Activities

Method of Learning

This 12-week course is designed to provide you with the fundamentals of software testing and software reliability, from software programs to Internet applications. Each week will be divided into two main parts. In the first part, your engagement with textbooks, online readings, resources, and activities is proposed for each respective unit. Self-guided activities include reflections on reading, practice exercises, self-assessments, and practice quizzes. These activities are designed to help you gauge your understanding of the materials covered in the unit. While these activities are not graded, engagement in those activities may help you verify knowledge, reflect on your learning experience, and build skills toward meeting the course learning outcomes. In the second part, you will be expected to participate in lab activities designed to acquire and improve your technology skills. The material covered in the labs will be included in major projects of the portfolio assignment and final examination in this course.

Course Structure

The primary learning components of unit work are:

- Reading learning materials on the course website and from the textbook;
- Applying concepts learned by doing self-guided activities;
- Participating in online discussions;
- Completing assignments and online quizzes.

Assessment

The grade determination for this course is indicated in the following table. A brief description of each assessment is provided below. Select content on the navbar to locate Assessments in the table of contents panel to review further details of each check. Due dates can be found under the Schedule heading of this outline.

Milestones	Total Score	Due Date	Distribution in Final Weight
Assignment-1	100	Oct. 7, 2022	10%
Midterm	100	Oct. 24, 2022	20%
Assignment-2	100	Oct. 28, 2022	15%
Assignment-3	100	Nov. 25, 2022	15%
Final Examination	100	Dec. 12, 2022	40%
Total			100%

Midterm and Final Exam

Paper-based

Lecture Schedule

Lecture	Day	Content
Lec.-1	Sept 12	Course Outline + Motivation + Introduction to Software Reliability and Testing
Lec.-2	Sept 14	The Psychology and Economics of Program Testing + Software Testing Terminology and Methodology + Basic Concepts in Testing + Verification and Validation + Software Reliability and System Reliability
Lec.-3	Sept 19	Dynamic Testing: Black-Box (or Functional) Testing Techniques
Lec.-4	Sept 21	
Lec.-5	Sept 26	Dynamic Testing: White-Box (or Structural) Testing Techniques
Lec.-6	Sept 28	
Lec.-7	Oct 3	Unit Testing and Static Testing
Lec.-8	Oct 5	Test Automation and Tools
Oct 10		Thanksgiving Day
Lec.-9	Oct 12	Validation Activities
Lec.-10	Oct 17	Integration Testing for Component-based Software and Regression Testing
Lec.-11	Oct 19	Data-Driven and Combinatorial Testing and Test Management
Lec.-12	Oct 24	Midterm (8:30-9:20 AM)
Lec.-13	Oct 26	Performance Testing and Measurement and Software Metrics + Testing Metrics for Monitoring and Controlling the Testing Process + Efficient Test Suit Management
Lec.-14	Oct 31	
Lec.-15	Nov 2	Software Quality Management
Lec.-16	Nov 7	Testing Process Maturity Models
Lec.-17	Nov 9	Automation and Testing Tools
Lec.-18	Nov 14	Testing Object-Oriented Programs/Software
Lec.-19	Nov 16	Higher-Order Testing and Testing Web-based Systems
Lec.-20	Nov 21	Debugging and Imperfect-debugging Models
Lec.-21	Nov 23	Testing in Agile World and Test-Driven Development
Lec.-22	Nov 28	System and Integration Testing
Lec.-23	Nov 30	Intro to Testing in Emerging Techniques: AI, Blockchain, IoT
Lec.-24 (Friday)	Dec. 2	Legal, Ethical, and Professional Aspects of Testing

Lab Schedule

Lab	Day	Expected to work on
Lab-1	Sept. 16	Assignment 1 (Due Date: Oct. 7, 2022)
Lab-2	Sept. 23	
Lab-3	Sept. 30	
Lab-4	Oct. 7	
Oct. 10		Thanksgiving Day
Lab-5	Oct. 14	Assignment 2 (Due Date: Oct. 28, 2022)
Lab-6	Oct. 21	
Lab-7	Oct. 28	
Lab-8	Nov. 4	Assignment 3 (Due Date: Nov. 25, 2022)
Lab-9	Nov. 11	
Lab-10	Nov. 18	
Lab-11	Nov. 25	

Course Specific Standard Statements

Acceptable Use

The University of Guelph has an Acceptable Use Policy, which you are expected to adhere.

<https://www.uoguelph.ca/ccs/infosec/aup>

Communicating with Your Instructor

During the course, your instructor will interact with you on various course matters on the course website using the following ways of communication:

- **Announcements:** The instructor will use Announcements on the Course Home page to provide you with course reminders and updates. Please check this section frequently for course updates from your instructor.
- **Ask Your Instructor Discussion:** Use this discussion forum to ask your instructor questions about the content or course-related issues you are unfamiliar with. If you encounter difficulties, the instructor is here to help you. Please post general course-related questions to the discussion forum so that all students have an opportunity to review the response. To access this discussion forum, select Discussions from the Tools dropdown menu.
- **Email:** If you have a conflict that prevents you from completing course requirements or have a question concerning a personal matter, you can send your instructor a private message by email. The instructor will respond to your email within 48 to 72 hours.
- **Teams:** If you have a complex question you would like to discuss with your instructor, you may book a Teams meeting. Teams meetings depend on the availability of you and the instructor and are booked on a first-come, first-served basis

Netiquette Expectations

For distance education courses, the course website is considered the classroom. The same protections, expectations, guidelines, and regulations used in face-to-face settings apply, plus other policies and considerations that come into play specifically because these courses are online. Inappropriate online behavior will not be tolerated. Examples of inappropriate online behavior include:

- Posting inflammatory messages about your instructor or fellow students;
- Using obscene or offensive language online;
- Copying or presenting someone else's work as your own;
- Adapting information from the Internet without using proper citations or references;
- Buying or selling term papers or assignments;
- Posting or selling course materials to course notes websites;
- Having someone else complete your quiz or completing a quiz for/with another student;
- Stating false claims about lost quiz answers or other assignment submissions;
- Threatening or harassing a student or instructor online;
- Discriminating against fellow students, instructors, and TAs;
- Using the course website to promote profit-driven products or services;
- Attempting to compromise the security or functionality of the learning management system; and
- Sharing your username and password.

Submission of Assignments to Dropbox

The Lab Check-off Forms, Portfolio Assignments, Discussion Summary Report, and Bonus Assignment should be submitted electronically via the online Dropbox tool. Do not leave the page when submitting your assignments using the Dropbox tool until your work has been successfully uploaded. To verify that your submission was complete, you can view the submission history immediately after the upload to see which files were uploaded successfully. The system will also email you a receipt. Save this email receipt as proof of submission. Be sure to keep a backup copy of all of your assignments if they are lost in transition. To avoid any last-minute computer problems, your instructor strongly recommends you save your projects to cloud-based file storage (e.g., Google Docs), or send them to your email account, so that should something happen to your computer, the assignment could still be submitted on time or resubmitted. You are responsible for submitting your projects on time as specified in the schedule section of this outline. Be sure to check the technical requirements and make sure you have the proper computer, that you have a supported browser, and that you have reliable Internet

access. Remember that technical difficulty is not an excuse not to turn in your assignment on time. Don't wait until the last minute, as you may get behind in your work. If, for some reason, you have technical difficulty submitting your assignment electronically, please contact your instructor or CourseLink Support. <http://spaces.uoguelph.ca/ed/contact-us/>

Late Policy

If you choose to submit your assignments to the Dropbox tool late, the full allocated mark will be reduced by 10% if submitted 0.5-12 hours late, 25% if submitted 12-48 hours late, and 50% if submitted 48-96 hours late. Ninety-six hours after the deadline for submitting the assignment, access to the Dropbox folder will be closed, and any charges not yet submitted will receive a zero. Missed quizzes will receive a zero; no supplemental/make-up examinations are available. Extensions will be considered for medical reasons or other extenuating circumstances. If you require an extension, discuss this with the instructor as soon as possible and well before the due date. Barring exceptional circumstances, extensions will not be granted once the due date has passed. These rules are not designed to be arbitrary, nor are they inflexible. They are designed to keep you organized, to ensure that all students have the same amount of time to work on assignments, and to help to return marked materials to you in the shortest possible time.

Obtaining Grades and Feedback

Unofficial assessment marks will be available in the Grades tool of the course website. If the assignment were submitted on time, your instructor would have grades posted online within 2 weeks of the submission deadline. Once your seLec.tions are marked, you can view your steps on the course website by seLec.ting Grades from the Tools dropdown menu on the navbar. Your course will remain open to you for seven days following the last day of the final exam period.

University of Guelph degree students can access their final grade by logging into WebAdvisor (using your U of G central ID). Open Learning program students should log in to the OpenEd Student Portal to view their final grade (using the same username and password you have used for your courses).

<https://webadvisor.uoguelph.ca/>

<https://courses.opened.uoguelph.ca/portal/logon.do?method=load>

Rights and Responsibilities When Learning Online

For distance education (DE) courses, the course website is considered the classroom, and the same protections, expectations, guidelines, and regulations used in face-to-face settings apply, plus other policies and considerations that come into play specifically because these courses are online. For more information on your rights and responsibilities when learning in the online environment, visit Rights and Responsibilities.

<http://opened.uoguelph.ca/student-resources/rights-and-responsibilities>.

University Standard Statements

University of Guelph: Undergraduate Policies

As a student of the University of Guelph, you need to understand your rights and responsibilities and the academic rules and regulations you must abide by. If you are a registered University of Guelph Degree Student, consult the Undergraduate Calendar for the current and previous academic years' rules, regulations, curricula, programs, and fees. If you are an Open Learning Program Student, consult the Open Learning Program Calendar for information about the University of Guelph's administrative policies, procedures, and services.

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/>
<http://opened.uoguelph.ca/student-resources/open-learning-program-calendar>

Email Communication

University of Guelph Degree Students

As per university regulations, all students must check their uoguelph.ca email account regularly: email is the official communication route between the University and its students.

When You Cannot Meet Course Requirements

When you cannot meet an in-course requirement due to illness or compassion, please advise your course instructor in writing with your name, ID number, and email contact.

University of Guelph Degree Students

Consult the Undergraduate Calendar for information on regulations and procedures for Academic Consideration.

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Drop Date

University of Guelph Degree Students

Students will have until the last day of classes to drop courses without academic penalty. Review the Undergraduate Calendar for regulations and procedures for Dropping Courses.

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Copies of Assignments

Keep paper and other reliable backup copies of all assignments: you may be asked to resubmit work at any time.

Accessibility

The University of Guelph is committed to creating a barrier-free environment. Providing student services is a shared responsibility among students, faculty, and administrators. This relationship is based on respect for individual rights, the dignity of the individual, and the University community's shared commitment to an open and supportive learning environment.

University of Guelph Degree Students

Students requiring service or accommodation, whether due to an identified, ongoing disability or a short-term disability, should contact Accessibility Services as soon as possible. Contact Accessibility Services at 519-824-4120 ext. 56208, email Accessibility Services, or visit the Accessibility Services website.

accessibility@uoguelph.ca

<https://wellness.uoguelph.ca/accessibility/>

Academic Misconduct

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community – faculty, staff, and students – to be aware of what constitutes academic misconduct and to do as much as possible to prevent literary offenses from occurring. University of Guelph students are responsible for abiding by the University's policy on academic misconduct regardless of their study location; faculty, staff, and students are responsible for supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection. Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who doubt whether an action on their part could be construed as an academic offense should consult with a faculty member or faculty advisor. The Academic Misconduct Policy is detailed in the Undergraduate Calendar.

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

Copyright Notice

Content within this course is copyright protected. Third-party copyrighted materials (such as book chapters and articles) have either been licensed for use in this course or copied under an exception or limitation in Canadian Copyright law. The fair dealing exemption in Canada's Copyright Act permits students to reproduce short excerpts from copyright-protected materials for purposes such as research, education, private study, criticism, and review, with proper attribution. Any other copying, communicating, or distribution of any content provided in this course, except as permitted by law, may be an infringement of copyright if done without proper license or the copyright owner's consent. Examples of infringing uses of copyrighted works would include uploading materials to a commercial third-party website or making paper or

electronic reproductions of all, or a substantial part, of works such as textbooks for commercial purposes. Students who upload copyrighted materials to CourseLink, such as book chapters, journal articles, or materials taken from the Internet, must ensure that they comply with Canadian Copyright law or with the University's electronic resource licenses. For more information about students' rights and obligations concerning copyrighted works, review Fair Dealing Guidance for Students. http://www.lib.uoguelph.ca/sites/default/files/fair_dealing_policy_0.pdf

Plagiarism Detection Software

Students should be aware that faculty have the right to use software to detect plagiarism or copying and to examine students orally on submitted work. For students guilty of academic misconduct, severe penalties can be imposed, including suspension or expulsion from the University.

Recording of Materials

Presentations related to course work—including Lectures—cannot be recorded or copied without the permission of the presenter, whether the instructor, a classmate or a guest Lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.