Course Outline

School:	Eng. Tech. & Applied Science
Department:	Information and Communication Engineering Technology (ICET)
Course Title:	Software Testing and Quality Assurance
Course Code:	COMP 311
Course Hours/Credits:	56
Prerequisites:	COMP 123
Co-requisites:	N/A
Eligible for Prior Learning, Assessment and Recognition:	Yes
Originated by:	Ilia Nika
Creation Date:	Fall 2008
Revised by:	Peter Volder, Paula McMIllan, Arben Tapia
Revision Date:	Fall 2020
Current Semester:	Winter 2023
Approved by:	ppesikan c/o

Chairperson/Dean

Students are expected to review and understand all areas of the course outline.

Retain this course outline for future transfer credit applications. A fee may be charged for additional copies.

This course outline is available in alternative formats upon request.

Acknowledgement of Traditional Lands

Centennial is proud to be a part of a rich history of education in this province and in this city. We acknowledge that we are on the treaty lands and territory of the Mississaugas of the Credit First Nation and pay tribute to their legacy and the legacy of all First Peoples of Canada, as we strengthen ties with the communities we serve and build the future through learning and through our graduates. Today the traditional meeting place of Toronto is still home to many Indigenous People from across Turtle Island and we are grateful to have the opportunity to work in the communities that have grown in the treaty lands of the Mississaugas. We acknowledge that we are all treaty people and accept our responsibility to honor all our relations.

Course Description

This course explores the goals of quality assurance and quality control activities performed during the life cycle of a software product. It focuses on integrating test processes with agile software development methodologies. Practical exercises give experience of design, specification, execution of tests plus test automation using tools through a mixture of instructor-directed exercises, demos and workshops as well as student group work and research leading to knowledge sharing.

Program Outcomes

Successful completion of this and other courses in the program culminates in the achievement of the Vocational Learning Outcomes (program outcomes) set by the Ministry of Colleges and Universities in the Program Standard. The VLOs express the learning a student must reliably demonstrate before graduation. To ensure a meaningful learning experience and to better understand how this course and program prepare graduates for success, students are encouraged to review the Program Standard by visiting http://www.tcu.gov.on.ca/pepg/audiences/colleges/progstan/. For apprenticeship-based programs, visit http://www.collegeoftrades.ca/training-standards.

Course Learning Outcomes

The student will reliably demonstrate the ability to:

1. Discuss different meanings of quality. Discuss the benefits quality assurance brings to organizations that produce software products and to users of software products.
2. Explain the difference between Quality Assurance and Quality Control. Describe how each relates to testing.
3. Articulate the principles of the Agile Manifesto and explain how various development methodologies can improve quality of software products.
4. Describe key stages in the testing process and name activities performed at each stage.
5. Classify artifacts involved in the software development life cycle and explain the importance of version control for code files and other types of documents.
6. Select types of tests and reviews (white/black box, static/dynamic, functional/non-functional...) appropriately to evaluate how well a software product meets the quality characteristics as identified by ISO/IEEE standards.
7. Formulate pass-fail criteria from product objectives and apply black-box test-design techniques to design tests to check whether software meets criteria.
8. Explore a variety of test and project management tools. State the goals and dangers of test automation.

9. Compare and contrast CMMI and ISO 9001 in terms of motivation and the process involved.

Essential Employability Skills (EES)

The student will reliably demonstrate the ability to*:

1. Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience.
2. Respond to written, spoken, or visual messages in a manner that ensures effective communication.
4. Apply a systematic approach to solve problems.
5. Use a variety of thinking skills to anticipate and solve problems.
6. Locate, select, organize, and document information using appropriate technology and information systems.
7. Analyze, evaluate, and apply relevant information from a variety of sources.
8. Show respect for diverse opinions, values belief systems, and contributions of others.
9. Interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals.
10. Manage the use of time and other resources to complete projects.
11. Take responsibility for one's own actions, decisions, and consequences.

**There are 11 Essential Employability Skills outcomes as per the Ministry Program Standard. Of these 11 outcomes, the following will be assessed in this course.*

Global Citizenship and Equity (GC&E) Outcomes

The student will reliably demonstrate the ability to*:

1. Identify one's roles and responsibilities as a global citizen in personal and professional life.
2. Identify beliefs, values and behaviours that form individual and community identities and the basis for respectful relationships.
6. Support personal and social responsibility initiatives at the local, national or global level.

**There are 6 institutional Global Citizenship & Equity outcomes. Of these 6 outcomes, the following will be assessed in this course.*

Methods of Instruction

This course material is imparted in a lecture format, lectures are interactive. Each class includes a lab component where students will have the opportunity to apply what had been presented in the lecture. Students work in groups and/or individually during the lab to complete specified tasks. All course materials will be posted on the course eCentennial site; Centennial learning management system.

Text and other Instructional/Learning Materials

Text Book(s):

Foundations of Software Testing, Third Edition (ITSQB Certification)

By: Rex Black, Erik Van Veenendaal, Dorothy Graham

Published by: Cengage, 2012

ISBN: 978-1-4080-44-5-6

Online Resource(s):

Additional readings from handouts, Web sites such as www.sqa.net and online research be assigned or recommended.

Material(s) required for completing this course:

Access to personal computers.

Custom Courseware:
Extensive lecture slides serve as course notes.

Classroom and Equipment Requirements
Computer Lab for all hours.

Evaluation Scheme
- Test 1: Test 1 covering the material for weeks 1-5
- Test 2: Final exam delivered during the final week of class
- Tools Quiz: Quiz on tools presented by all students as the deliverable of the team research project
- Assignments, Workshops, Class Works: Eight assignments completed as course work.

Evaluation Name	CLO(s)	EES Outcome(s)	GCE Outcome(s)	Weight/100
Test 1	1, 2, 3, 4	1, 2	1, 2, 6	25
Test 2	1, 2, 3, 4, 5, 6, 7, 8, 9	1, 2, 4, 5, 6	1, 2, 6	20
Team Research Project and Presentation	8	1, 6, 7, 8, 9, 10, 11		10
Tools Quiz	8	7, 8	1	8
Assignments, Workshops, Class Works	4, 6, 7, 8	1, 2, 4, 5, 6, 7, 8, 9	1	37
Total				100%

If students are unable to write a test they should immediately contact their professor or program Chair for advice. In exceptional and well documented circumstances (e.g. unforeseen family problems, serious illness, or death of a close family member), students may be able to write a make-up test.

All submitted work may be reviewed for authenticity and originality utilizing Turnitin®. Students who do not wish to have their work submitted to Turnitin® must, by the end of the second week of class, communicate this in writing to the instructor and make mutually agreeable alternate arrangements.

When writing tests, students must be able to produce official Centennial College photo identification or they may be refused the right to take the test or test results will be void.

Tests or assignments conducted remotely may require the use of online proctoring technology where the student's identification is verified and their activity is monitored and/or recorded, both audibly and visually through remote access to the student's computer and web camera. Students must communicate in writing to the instructor as soon as possible and prior to the test or assignment due date if they require an alternate assessment format to explore mutually agreeable alternatives.

Student Accommodation
The Centre for Accessible Learning and Counselling Services (CALCS) (http://centennialcollege.ca/calcs) provides programs and services which empower students in meeting their wellness goals, accommodation and disability-related needs. Our team of professional psychotherapists, social workers, educators, and staff offer brief, solution-focused psychotherapy, accommodation planning, health and wellness education, group counselling, psycho-educational workshops, adaptive technology, and peer support. Walk in for your first intake session at one of our service locations (Ashtonbee Room L1-04,

Morningside Room 190, Progress Room C1-03, The Story Arts Centre Room 285, Downsview Room 105) or contact us at calcs@centennialcollege.ca, 416-289-5000 ext. 3850 to learn more about accessing CALCS services.

Use of Dictionaries

- Any dictionary (hard copy or electronic) may be used in regular class work.

Program or School Policies

N/A

Course Policies

N/A

College Policies

Students should familiarize themselves with all College Policies that cover academic matters and student conduct.

All students and employees have the right to study and work in an environment that is free from discrimination and harassment and promotes respect and equity. Centennial policies ensure all incidents of harassment, discrimination, bullying and violence will be addressed and responded to accordingly.

Academic Honesty

Academic honesty is integral to the learning process and a necessary ingredient of academic integrity. Forms of academic dishonesty include cheating, plagiarism, and impersonation, among others. Breaches of academic honesty may result in a failing grade on the assignment or course, suspension, or expulsion from the college. Students are bound to the College's AC100-11 Academic Honesty and Plagiarism policy.

To learn more, please visit the Libraries information page about Academic Integrity https://libraryguides.centennialcollege.ca/academicintegrity and review Centennial College's Academic Honesty Module: https://myappform.centennialcollege.ca/ecentennial/articulate/Centennial_College_Academic_Integrity_Module_%202/story.html

Use of Lecture/Course Materials

Materials used in Centennial College courses are subject to Intellectual Property and Copyright protection, and as such cannot be used and posted for public dissemination without prior permission from the original creator or copyright holder (e.g., student/professor/the College/or third-party source). This includes class/lecture recordings, course materials, and third-party copyright-protected materials (such as images, book chapters and articles). Copyright protections are automatic once an original work is created, and applies whether or not a copyright statement appears on the material. Students and employees are

bound by College policies, including AC100-22 Intellectual Property, and SL100-02 Student Code of Conduct, and any student or employee found to be using or posting course materials or recordings for public dissemination without permission and/or inappropriately is in breach of these policies and may be sanctioned.

For more information on these and other policies, please visit www.centennialcollege.ca/about-centennial/college-overview/college-policies.

Students enrolled in a joint or collaborative program are subject to the partner institution's academic policies.

PLAR Process

This course is eligible for Prior Learning Assessment and Recognition (PLAR). PLAR is a process by which course credit may be granted for past learning acquired through work or other life experiences. The PLAR process involves completing an assessment (portfolio, test, assignment, etc.) that reliably demonstrates achievement of the course learning outcomes. Contact the academic school to obtain information on the PLAR process and the required assessment.

Topical Outline (subject to change):

Week	Topics	Readings/Materials	Weekly Learning Outcome(s)	Instructional Strategies	Evaluation Name and Weight	Evaluation Date
1	Course Overview Defining quality and what makes a successful software product Seven principles of testing	Text Lecture slides Chapter 1 of "Software Testing" 2nd Edition by Ron Patton	(1) What quality means to different stakeholders (2) Implications of the seven principles of testing	Lecture In class discussion Team reading and discussion	Assignment 1: answer questions on reading	Week1
2	Defining QA, QC, and QMS The 5 stages of a test process The difference between testers and developers Debugging	Text Lecture slides	Explain the difference between QA and QC and what an QMS is Discuss how test and development teams work together Name and state the purpose of the stages in a test process Use a debugger to find defects in code	Lecture In-class discussion Hands-on exercise	Assignment 2: using an IDE's degugger to locate the source of defects	Week2
3	. Reviewing the Software Development Life Cycle . The evolution from waterfall to Agile through the V Model . The Agile Manifesto . Test-Driven Development (TDD) and Feature-Driven Development (FDD)	Lecture slides Agile Manifesto web site eBooks: "Agile for Dummies" and "Agile 101"	. Explain the goal and impact of the V-Model . Describe the 4 levels of testing defined by the V-Model . Define incremental and iterative development . Use TDD in a Lab	Lecture In-class discussion Hands-on exercise	Assignment 3: team exercise applying TDD (pseudo-code) to a system requirements	Week3
4	. Overview of some implementations of Agile: DSDM, XP, Scrum, RUP... . Software quality characteristics . Categories of tests	Lecture slides Web sites and videos to be shown in class eBook: "Agile 101" and "Agile for Dummies"	. Compare and contrast different implementations of Agile . Explain how tests of different types are appropriate for different quality characteristics and suggest strategy for designing tests . Use specifications to design Test cases in a Lab	Lecture In-class discussion Hands-on exercise	Assignment 4: Team exercise writing a Test Case Specification	Week4
5	. Test metrics . Testing end-to-end: from inception to maintenance	Text Lecture slides	. Explain the additional challenges of testing during maintenance	Lecture In-class discussion	Test 1	Week5

Week	Topics	Readings/Materials	Weekly Learning Outcome(s)	Instructional Strategies	Evaluation Name and Weight	Evaluation Date
6	Static and White-Box testing: . Types of reviews: . peer/technical review; . walkthrough . inspection . Static code analysis	Text Lecture slides	Describe the goals, people involved and format typically taken by different forms of reviews Calculate cyclomatic complexity of code Perform static code analysis using code	Lecture In-class discussion Hands-on exercise	Assignment 5: perform static code analysis using a tool and answer questions about results	Week6
7	Dynamic Black-Box Testing . using Equivalence Partitions (EP) . Boundary Value Analysis (BVA) . Decision Tables (DT) Unit test tool	Text Lecture slides	. Perform unit testing using a tool . Analyze requirements to identify pass/fail criteria and select and appropriate test design technique to help create test case specifications	Lecture In-class discussion Hands-on exercise	Assignment 6: Scripted tutorial on a tool for unit testing	Week7
8	Black Box Testing design . continuing/reinforcing previous techniques (EP/BVA,DT) . using state transition diagrams (ST)	Text Lecture slides	. Use the analysis of the requirements to identify pass/fail criteria to select and implement the appropriate test design technique and with its help create test case specifications . Start analyzing requirements to create state transition diagrams for objects in the required system. Then use the state transition diagram to identify test cases.	Lecture In-class discussion Hands-on exercise	Team assignment 7: Black Box Testing Part I - Given a program specification, use equivalence partitions with boundary value analysis or decision table to identify test cases.	Week8
9	. Complete discussion of black-box test design with Exploratory testing and use-case testing . Test documentation	Text Lecture slides	. Use the analysis of the requirements to create state transition diagrams and with their help create test case specifications . Maximize effectiveness of dynamic testing and minimize number of test cases required to achieve confidence that a software system has been thoroughly tested.	Lecture In-class discussion Hand out description of team research project	Team assignment 8: Black Box Testing Part II - Given a program specification, identify	Week9

Week	Topics	Readings/Materials	Weekly Learning Outcome(s)	Instructional Strategies	Evaluation Name and Weight	Evaluation Date
					objects with changing state, draw state transition diagrams and then identify test cases	
10	Defect handling process including confirmation and regression testing Configuration management/SCM/Version control	Test Lecture slides	Describe the states of a defect report in a typical defect handling process Explain the importance of using an SCM throughout the life cycle of a software product	Lecture In-class discussion Hands-on exercis	Test'em Workshop	Week10
11-12	Test and project management tools Test automation	Web sites: student research White papers and articles made available to students	Exchange knowledge by researching a tool and then teaching it to the rest of the class.	Student presentations Recap lecture to include test automation	Project presentation for team work Tools quiz for learning from peers	Week11-12
13	ISO 9001 certification CMMI Brief history of QA and QA gurus	Lecture slides ISO 9000 brochures Article from ASQ: "Short History of QA"	Explain why companies invest in ISO 9001 certification Describe the 5 CMMI levels Recognize the names of some QA pioneers and briefly discuss thier contribution to modern QA	Lecture in-class discussion	CucumberJS(and/or CucumberJava) Workshop	Week13
14	Review and final test	Review slides	Discuss the roles and goals of QA professionals and testers Apply the test process to real-world development situations From system objectives, identify test criteria and design test cases Discuss the hows and whys of verifcation and validation testing	In class discussion Practice for exam questions	Test 2	Week14