湖北工業大學
HUBEI UNIVERSITY OF TECHNOLOGY

Course Title	Software Testing and Quality Assurance
Course Code	CMPT 3521
Semester	Summer 2026
Course Length	4 Weeks, 60 Contact Hours
Credits	4
Instructor	TBA
Office	TBA
Email	TBA
Prerequisite	CMPT 1011 Introduction to Computer Science CMPT 2141 Data Structures and Algorithms

Course Description:

This course provides a comprehensive exploration of the methodologies, tools, and processes required to ensure the development of high-quality software systems. Students will examine the entire software lifecycle with a focus on defect prevention, detection, and removal. Key topics include systematic testing strategies, formal inspection techniques, software metrics, and the integration of quality processes within modern development frameworks.

Course Goals:

Students who successfully complete this course will demonstrate competency in the following general education core goals:

- **Critical Thinking Skills** – Students will engage in analytical thinking, demonstrating the ability to critically evaluate, synthesize, and apply knowledge to complex problems, and construct well-reasoned solutions and arguments.
- **Independent Research and Inquiry** – Students will conduct independent research, utilizing academic resources to explore relevant topics, formulating research questions, analyzing data, and presenting findings in a coherent, scholarly manner.
- **Problem-Solving and Application** – Students will apply theoretical concepts and methodologies learned in the course to real-world problems, demonstrating the ability to develop practical solutions informed by academic inquiry.
- **Global and Cultural Awareness** – Students will gain awareness of the global and cultural contexts relevant to the course, appreciating diverse perspectives and considering the implications of their studies in a broader, international context.

Student Learning Outcomes:

Upon completion of this course, students will be able to:

- Apply black-box and white-box testing techniques to design effective test cases;
- Conduct formal technical reviews and code inspections to identify logic and design flaws;
- Implement automated testing harnesses and continuous integration workflows;
- Utilize software metrics to assess product quality and process efficiency;
- Understand the trade-offs between different quality assurance methods in various lifecycle models.

Textbooks/Supplies/Materials/Equipment/ Technology or Technical Requirements:

Primary:

Software Testing and Quality Assurance: Theory and Practice by Kshirasagar Naik, Priyadarshi Tripathy. Wiley.

Secondary:

Software Testing and Analysis: Process, Principles and Techniques by Mauro Pezzè and Michal Young. John Wiley & Sons.

Software and Technology Requirements:

All programming work in this course uses Java 17 or Python 3.11.

Course Requirements:

Homework Assignments (15%): Regular assignments involve designing test cases, performing code reviews, calculating metrics, or analyzing inspection results.

Midterm Examinations (two exams, 15% each - 30% total): These exams evaluate foundational understanding of quality concepts, process models, and core testing/inspection techniques covered up to that point. They include a mix of short-answer, multiple-choice, and problem-solving questions (e.g., designing sample test cases or analyzing coverage).

Final Examination (30%): This comprehensive exam at the end of the term assesses integrated knowledge across all topics, including metrics, dependability, security, and the ability to compare defect-removal effectiveness of different approaches. It features scenario-based questions requiring application of concepts to realistic software quality challenges.

Group Course Project (25%): Working in small teams (3-4 students), participants apply quality assurance practices to develop and validate a software system based on provided user needs. Deliverables include phased submissions such as requirements/test plans, prototypes with inspection reports, automated test suites, metrics analysis, and final integration/delivery with quality documentation.

Assessments: Activity	**Percent Contribution**
Homework Assignments	15%
Midterm Examination 1	15%
Midterm Examination 2	15%
Final Examination	30%
Group Course Project	25%

Grading:

Final grades will be based on the sum of all possible course points as noted above.

Grade	Percentage of available points
A	94-100
A-	90-93
B+	87-89
B	84-86
B-	80-83
C+	77-79
C	74-76
C-	70-73
D	64-69
D-	60-63
F	0-59

Course Schedule:
The schedule of activities is subject to change at the reasonable discretion of the instructor. Minor changes will be announced in class, major ones provided in writing.

CMPT 3521 Schedule			
Lecture	Topic	Readings	Key Activities
L1	Introduction to software quality: definitions, challenges, and achievement strategies	Ch. 1.1-1.6, 1.17	
L2	Software quality factors, measurement basics, and reliability notions	Ch. 1.2, 1.6, 1.17	
L3	Software process models and plans for quality improvement	Ch. 17 + Ch. 18	
L4	Modern agile processes and Extreme Programming principles	Ch. 3.7 + Ch. 14.7	Team formation for project
L5	Testing fundamentals: levels, objectives, and test case design	Ch. 1.7-1.16, Ch. 2	
L6	Black-box/functional testing: equivalence partitioning and boundary analysis	Ch. 9.4-9.5 + Ch. 6	Project: initial test plans due
L7	Advanced black-box techniques: decision tables, pairwise testing, and domain analysis	Ch. 9.3, 9.6-9.9 + Ch. 6	
L8	White-box testing: control flow graphs and coverage criteria	Ch. 4	
L9	White-box testing: data flow testing and anomaly detection	Ch. 5	
L10	Mutation testing, debugging, and advanced structural methods	Ch. 3.5-3.6	Midterm Exam 1 review
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L11	Unit testing practices: static/dynamic, tools, and frameworks	Ch. 3.1-3.4, 3.8-3.9	Project: rapid prototype & initial inspection due
L12	System integration testing: strategies, interfaces, and techniques	Ch. 7	
L13	System-level testing categories:	Ch. 8.1-8.6	

	functionality, robustness, and performance		
L14	Regression testing, continuous testing, and test automation	Ch. 8.11 + Ch. 12	Project: requirements testing validation due
L15	Test maintenance, harnesses, tracking, and tools	Ch. 12.10-12.16	
L16	Software inspection: systematic reviews, processes, and formal methods	Ch. 3.2	
L17	Inspection in practice: requirements, design, code, and peer reviews	Ch. 3.2 + Ch. 18	Project: backend prototype & review due
L18	Automated inspection, static analysis, refactoring, and clone detection	Ch. 3.2 + supplementary	
L19	Software metrics fundamentals: assessment, prediction, and basics	Ch. 11.8-11.10 + Ch. 13.4-13.6	Midterm Exam 2 review
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L20	Product and code/structure metrics: size, complexity, faults, and failures	Ch. 17.2-17.3 + Ch. 13	
L21	Process metrics: effort prediction, regression analysis, and function points	Ch. 18 + Ch. 13	Project: unit testing & metrics report due
L22	Software dependability: reliability models and issues	Ch. 15	
L23	Software security: common issues, methods, and web application focus	External reading	
L24	Integration of quality practices, case studies, and advanced topics	All chapters (review)	Project: integration & delivery due
L25	Project Presentation		Final project submission & presentation
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Accommodation Statement:

Academic accommodations may be made for any student who notifies the instructor of the need for an accommodation. It is imperative that you take the initiative to bring such needs to the instructor's attention, as he/she is not legally permitted to inquire. Students who may require assistance in emergency evacuations should contact the instructor as to the most appropriate procedures to follow.

Academic Integrity Statement

Each student is expected to maintain the highest standards of honesty and integrity in academic and professional matters. The University reserves the right to take disciplinary action, up to and including dismissal, against any student who is found guilty of academic dishonesty or otherwise fails to meet the standards. Any student

judged to have engaged in academic dishonesty in coursework may receive a reduced or failing grade for the work in question and/or for the course.

Academic dishonesty includes, but is not limited to, dishonesty in quizzes, tests, or assignments; claiming credit for work not done or done by others; hindering the academic work of other students; misrepresenting academic or professional qualifications within or outside the University; and nondisclosure or misrepresentation in filling out applications or other University records.

Other Items:

Attendance and Expectations
All students are required to attend every class, except in cases of illness, serious family concerns, or other major problems. We expect that students will arrive on time, be prepared to listen and participate as appropriate, and stay for the duration of a meeting rather than drift in or out casually. In short, we anticipate that students will show professors and fellow students maximum consideration by minimizing the disturbances that cause interruptions in the learning process. This means that punctuality is a must, that cellular phones be turned off, and that courtesy is the guiding principle in all exchanges among students and faculty. You will be responsible for the materials and ideas presented in the lecture.

Assignment Due Dates
All written assignments must be turned in at the time specified. Late assignments will not be accepted unless prior information has been obtained from the instructor. If you believe you have extenuating circumstances, please contact the instructor as soon as possible.

Make-Up Work
The instructor will not provide students with class information or make-up assignments/quizzes/exams missed due to an unexcused absence. Absences will be excused and assignments/quizzes/exams may be made up only with written documentation of an authorized absence. Every effort should be made to avoid scheduling appointments during class. An excused student is responsible for requesting any missed information from the instructor and setting up any necessary appointments outside of class.

Access, Special Needs, and Disabilities
Please notify the instructor at the start of the semester if you have any documented disabilities, a medical issue, or any special circumstances that require attention, and the school will be happy to assist.