CS 684 Software Testing and Quality Assurance

Fall 2025

Catalog Description. This course discusses software faults and techniques to reduce faults and improve software quality. Software systems are some of the most complex human artifacts ever built and also some of the most critical means to ensure our safety, well being, and prosperity. This course teaches techniques to ensure software systems perform their function correctly. Topics include software specifications, goals of testing, techniques of test data selection, test oracle design, test data analysis, test lifecycle and quality impacts of testing.

Spring 2025 twist. There are, broadly, two families of methods to ensure software quality: static methods, which analyze the source code, and dynamic methods with execute and observe the code's behavior. In this course we will study them both, and see how they can be combined strategically to achieve the highest return on investment in a quality assurance effort. Studying them in concert gives us better insights into each.

Prerequisites. The catalog does not list any prerequisites, but of course we expect incoming students to have taken programming courses and possibly an undergraduate software engineering course (CS490 or equivalent).

Instructor. Ali Mili, mili@njit.edu. GITC 4409. (973) 596 5215.

Office hours: Fridays, 1:00-3:00 PM.

Textbook. The course will broadly follow the outline of the following book, but *you are not required* to purchase it. Appropriate reference materials, from the textbook and other sources, will be made available to the students as needed.

Software Testing: Concepts and Operations, by A. Mili and F. Tchier. Quantitative Software Engineering Series. Wiley, 2015. ISBN 978-1-118-66287-8.

Delivery. This class meets once a week for three hours:

- Friday, 8:30 AM – 11:20 AM. CKB 114, section 001.

We will usually divide this into two sessions of an hour and thirty minutes.

- 8:30 AM- 10:00 AM: Lecture.
- 10:00 AM- 11:20 AM: Exercises. Active participation of students is expected.

Regular attendance and participation is expected.

Schedule.

Below is a tentative schedule; we may depart from it depending on the interest of the students and the pace of the course.

week	Date	topic	Reference	Assignment Out	Assignment Due
1	September 5	SW Testing Lifecycle	Ch 3		
2	September 12	SW Specifications	Ch 4	HW1	
3	September 19	Program Functions	Bibliography		
4	September 26	Absolute Correctness	Ch 5	HW2	HW1
5	October 3	Faults, Errors, Failures	Ch 6		
6	October 10	Detector Sets	Bibliography	HW3	HW2
7	October 17	Relative Correctness	Bibliography		
8	October 24	**Midterm**		HW4	HW3
9	October 31	Test Data Selection	Bibliography		
10	November 7	Test Coverage	Bibliography	HW5	HW4
11	November 14	Functional Criteria	Ch 9		
12	November 21	Structural Criteria	Ch 10	HW6	HW5
13	December 5	Test Driver Design	Ch 11, 12, 13		
16	December 18	**Final Exam**			HW6

This schedule is tentative; the actual schedule may differ, depending on the interest of the students and their background. The date of the final exam is tentative; if the registrar posts a final exam calendar, we will go by his decision.

Grading. Students will be graded according to the following criteria:

- Homeworks: 6 x 5 = 30 %.
- Midterm: 30 %.
- Final Exam (covers the whole semester): 40 %.

Mapping averages to letter grades will be done on the basis of the following table, but may be changed if it proves too severe.

Average	Grade
90< -- ≤ 100	A
80< -- ≤ 90	B+
70 < -- ≤ 80	B
60 < -- ≤ 70	C+
50 < -- ≤ 60	C
0 ≤ -- ≤ 50	F