

# SWE 6673: Software Testing and Verification

## Semester Year

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*Instructor:*  
*Email:*  
*Web*  
*Office:*  
*Office Hours:*

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### **Course Information**

Section:  
CRN:

**Prerequisites:** SWE6623

### **Course Objectives**

This course covers concepts, principles, and techniques related to software testing and formal program verification. The course defines the concept of quality in software developments and product and explains how to develop a quality/test plan.

The notion of validation and verification is explained in the context of different testing techniques, which include black box testing and white box testing, and other techniques such as inspection and formal verification. The emphasis of the course is on testing techniques, ranging from unit testing to regression testing.

At the end of the course, the student will be able to

1. Define the concept of quality for software development and software products and compare different definitions;
2. Develop a quality/test plan, encompassing both validation & verification
3. Conduct inspections and reviews of (non-executable) artifacts
4. Apply at least one formal verification approach
5. Design and run test cases from black box testing techniques based on logic coverage and input-output partition coverage
6. Design test cases from white box testing techniques based on control flow graph coverage, data flow coverage and program slices
7. Track and explain test results from applying different testing techniques at different levels through the software life cycle
8. Explain and apply different automatic debugging techniques
9. Critique and evaluate topical issues and state-of-the-art methods and techniques related to testing and formal verification.

### **Topics Covered**

- Software quality: general concepts
- Software quality standards and documents
- Testing
  - Introduction and general concepts
  - Black-box testing
  - White-box testing
  - Regression testing
- Inspections
- Program analysis
- Debugging
- Formal verification: Model checking

### **Grading**

- Paper/Tool presentation: 20% (5% slides, 5% clarity of the presentation, 10% content)
- Modules interactive activities/quizzes/participation in discussions: 15%
  - For in class students, online discussions/activities can be substituted by in class discussions. I will advise you on a weekly base.
- Assignments: 35%
- Tests (3 tests: one after module 4, one after module 8, one after module 12): 30% (10% each)

### **Notes**

- The percentages are indicative and may change.
- Items within one category may be weighted differently (e.g., simpler assignments will be weighted less than more complex assignments).

Module	Week(s)	Topic	Assessment/Work
Module #1	Week 1	Introduction and overview	Discussion
Module #2	Week 2	Introduction to testing	Discussion and Quiz
Module #3	Weeks 3-4	Black-box Testing	Assignment to apply black-box testing techniques and Quiz
Module #4	Weeks 5-6	White-box Testing	Assignment to apply white-box testing techniques, Discussion and Quiz
Week 6		Test #1	
Module #5	Week 7	Data-flow based testing	Discussion, Quiz, and In-class Exercise
	Week 8	Module #3-#5 Wrap up	
Module #6	Week 9	Fault-based testing	Assignment on mutation testing and Quiz
Module #7	Week 10	System, Acceptance and Regression Testing	Discussion and Quiz
Module #8	Week 11	Inspection	Group Assignment on code inspection and Quiz
Week 11		Test #2 (Module #4 - #7)	
Week 12		Declare presentation topic	The presentation should be based on a research paper or a testing/verification tool
Module #9	Weeks 12	Debugging	Discussion and Quiz
SPRING BREAK			
Module #10	Weeks 13 -14	Formal Verification: Model Checking	Assignment and Quiz
Module #11	Week 15 - Final Week	Presentation	
Final week		Test #3	

## **Responsibilities of Students**

1. All assignments (if not otherwise explicitly specified) must be performed individually, without any collaboration with other people inside or outside the class.
2. Except where explicitly stated, assignments are due by 11:59pm on the due date.
3. Deliverables that are documents must be in PDF (preferred) or text format. If not explicitly specified, other formats (e.g., doc, xls, and ppt) are not permitted.

## **Class Policies**

### **Academic Misconduct**

Every KSU student is responsible for upholding all provisions of the Student Code of Conduct, as published in the Undergraduate and Graduate Catalogs. The Code of Conduct

([http://catalog.kennesaw.edu/preview\\_course.php?catoid=27&coid=48103&print](http://catalog.kennesaw.edu/preview_course.php?catoid=27&coid=48103&print)) includes the following:

*Section II of the Student Code of Conduct addresses the University's policy on academic honesty, including provisions regarding plagiarism and cheating, unauthorized access to University materials, misrepresentation/falsification of University records or academic work, malicious removal, retention, or destruction of library materials, malicious/intentional misuse of computer facilities and/or services, and misuse of student identification cards. Incidents of alleged academic misconduct will be handled through the established procedures of the University Judiciary Program, which includes either an "informal" resolution by a faculty member, resulting in a grade adjustment, or a formal hearing procedure, which may subject a student to the Code of Conduct's minimum one semester suspension requirement.*

*Students involved in off-campus activities shall not act in a disorderly or disruptive fashion, nor shall they conduct any dangerous activity.*

*Students involved in off-campus activities shall not take, damage or destroy or attempt to take, damage or destroy property of another.*

### **Students with Disabilities**

*If you have a specific physical, psychiatric, or learning disability and require accommodations, please let me know early in the semester so that your learning needs may be appropriately met. You will need to provide documentation of your disability to the Student Disability Services office, located in the Student Center room 267, and obtain a list of approved accommodations.*

### **Course Withdrawal**

Please refer to the KSU Undergraduate Catalog

(<http://catalog.kennesaw.edu/content.php?catoid=24&navoid=2171&hl=Withdrawal&returnto=search#withdrawalfromclasses>)

### **Late Assignments/Projects**

Late work will be penalized by deducting 15% of its total grade per calendar day and will not be evaluated if submitted with more than 3 days delay. Late work is penalized for two reasons: to be fair (all students should be given the same time limits!) and to

help you to have sufficient time for each assignment (if you spend too much time on one assignment, it is quite likely that you will have insufficient time to spend on the subsequent one).

If you will have to miss a deadline for extraordinary reasons (e.g., personal illness, death in the family, etc.), you should inform me as soon as you can, indicating when you will submit the work. The instructor will try to accommodate your needs.

### **Communication**

- Email, office hours or after class are the preferred and most reliable methods of contact.
- In your emails, please specify the class you are referring to in the email subject.
- Emails are generally replied within 24 hours, but emails sent on Friday afternoon or over the weekend are not likely to be replied in less than 48 hours. If you do not receive a reply within 48 hours, please resend your email or ask about it during class.

I am happy to hear your feedback about the course and to answer your questions about assignments, projects, topics covered in class, research, or similar communication. Moreover, feel free to contact me to request additional time for an assignment because of significant health, personal, or educational matter.

### **Writing Center**

*The KSU Writing Center helps students in all majors improve their writing. Experienced, friendly writing assistants help with topic development, revision, research, documentation, grammar, and more. For more information or to make an appointment, visit [writingcenter.kennesaw.edu](http://writingcenter.kennesaw.edu) or stop by English Building, Room 242 (Kennesaw campus) or Building A, Room 184 (Marietta campus).*