CMSC 425/525: Introduction to Software Analysis and Testing

Spring 2023 Syllabus

Catalog Listing:	CMSC 425/525 - Introduction to Software Analysis and Testing
Course Level:	Undergraduate & Graduate
Prerequisites:	CMSC 355 with a grade of C or better
Instructor:	Kostadin Damevski
Office:	ERB 2324
E-mail:	kdamevski@vcu.edu
Meeting Time:	3:30-4:45pm T,Th (East 2214)
Office Hours:	2:30-3:30pm T,Th and by appointment (on Zoom)
Slack:	http://vcucs.slack.com (#testingclass)
Class Website:	Canvas

1.0 – Overview (Catalog Course Description):

Semester course; 3 lecture hours. 3 credits. Prerequisites: CMSC 355 with a grade of C or better, or graduate student standing. Practical introduction to testing complex software applications. An introduction to concepts and techniques used in the analysis of software, including basic and advanced control flow and data flow analyses. Using analytic results to derive test data and validate the correct implementation of programs. Advanced testing strategies including random, structural, mutation and fuzzing.

2.0 – Course Structure:

- Lecture hours/week – 3
- Lab hours/week – 0

3.0 – Course Goals

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

1. Demonstrate an understanding of the goals and principles of software verification and validation;

2. Describe and distinguish among the different types and levels of testing (unit, integration, system, and acceptance);
3. Apply systematic and coverage-driven testing strategies to complex software applications;
4. Accurately discuss several state of the art approaches in the field of software testing
5. Demonstrate an understanding of the theoretical and practical limits of static and dynamic program analysis techniques;
6. Use modern, widely-applicable testing and program analysis techniques, metrics and tools in a software development project.

4.0 – ABET Criteria Addressed:

- (2) Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

5.0 – Major Topics Covered:

- Software Verification and Validation
- Test Case Coverage
- Test-Driven Development
- Coverage-Driven Systematic Software Testing
- Advanced Testing Strategies and Automatic Test-Case Generation
- Limitations of Testing
- Control-Flow and Data-Flow Program Analysis
- Static and Dynamic Program
- Symbolic and Concolic Hybrid Program Analysis
- Program Analysis-Driven Testing

6.0 – Textbook(s):

- Ammann and Offutt, *Introduction to Software Testing*, 2nd Edition, 2016.
- Nielson, Nielson, and Hankin, *Principles of Program Analysis*, Springer, 2004.

7.0 – Grading and Attendance Policy:

General Instructions:

There are several individual projects in this course. Significant amount of time outside class meetings will likely be required for the successful completion of the projects, including appropriate communication with the teaching staff. Students should be prepared to read, understand, and discuss recent papers in the area of program analysis.

Category	Percentage Weight
Final Exam	25%

Midterm Exam	25%
Projects/Homework	45%
Classwork	5%

Grading scheme:

A: >= 90%
B: >= 80% and < 90%
C: >= 70% and < 80%
D: >= 60% and < 70%
F: < 60%

Grading policy for graduate students:

In addition to the work required of undergraduates in the course, the graduate students, i.e., those enrolled in the CMSC 525 sections, will receive additional tasks and additional questions on the exams.

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Students should visit http://go.vcu.edu/syllabus and review all syllabus statement information. The full university syllabus statement includes information on safety, registration, the VCU Honor Code, student conduct, withdrawal and more.