

# CSCE 747 - Syllabus

## 1: Course Overview

**Course Name:** CSCE 747 - Software Testing and Quality Assurance

**Semester:** Spring 2016

**Instructor:** Greg Gay ([greg@greggay.com](mailto:greg@greggay.com))

**Lecture Hours:** Tuesday and Thursday, 8:30 - 9:45 AM, 2A07 Swearingen Engineering Center

**Office Hours:** Tuesday and Thursday, 4:00 - 5:00 PM, 3A66 Swearingen Engineering Center

**Website:** <https://dropbox.cse.sc.edu/course/view.php?id=90> (Moodle)  
<http://greggay.com/courses/spring16csce747/> (static backup)

## Course Description

Our society is built on software. It powers our homes, it manages our private information, it controls our cars, it automates our factories and it even regulates our bodies. It is incredibly important that we construct robust, operational systems, especially given growing demand for features, limited development budgets and strict time constraints. The key to delivering robust software is through a thorough verification and validation process.

In this course, we will explore the process of software verification and examine a variety of methods to test systems, prove their correctness, and make an argument that the software we build is reliable and safe to use.

## Outline of Topics to be Covered

- Introduction and Fundamentals of Test and Analysis (1 week)
- Functional and Combinatorial Testing (1 week)
- Test Case Adequacy/Structural Testing (1 week)
- Data Flow Testing (1 week)
- Testing Object-Oriented Software (1 week)
- Model-Based Testing and Finite State Verification (1 week)
- Proofs and Analysis (1 week)
- Execution and Automation (3 weeks)
- Inspections (1 week)
- End-of-Testing Activities and Assessing Reliability (1 week)
- Presentations (2 weeks)

See course schedule for specifics.

## Learning Outcomes

1. The students will be familiar with the process and activities of software verification.
2. The students will understand the process of applying tests to software and the fundamental components of a test case.
3. The students will be able to derive test cases from software requirement specifications - including being able to partition input and output domains, form test specifications, and identify valid combinations of input.
4. The students will understand and be able to distinguish between methods of judging test case adequacy and how to design tests that will accomplish the obligations of such methods.
5. The students will understand how to build models of system behavior and prove that they obey required properties.
6. The students will be able to make logical arguments that prove the correctness of program implementations.
7. The students will be able to write code to automate test execution and analysis.
8. The students will be familiar with methods of measuring software reliability.

## Textbooks

- Required: *Software Testing and Analysis*. Mauro Pezze and Michal Young. Wiley, 2008. ISBN 978-0-471-45593-6.
  - [http://www.amazon.com/Software-Testing-Analysis-Principles-Techniques/dp/0471455938/ref=tmm\\_pap\\_swatch\\_0?\\_encoding=UTF8&qid=&sr=](http://www.amazon.com/Software-Testing-Analysis-Principles-Techniques/dp/0471455938/ref=tmm_pap_swatch_0?_encoding=UTF8&qid=&sr=)

Additional readings will be assigned as the course progresses. These readings will be available on the course web page or handed out in class.

## 2: Course Requirements and Grading

### Requirements

CSCE 740 is a required prerequisite for this course.

You should have knowledge of some higher level programming language (such as C, C++, or Java). Programming assignments and code examples for the course will primarily use Java; therefore, you should be able to pick the language up on your own if you do not already have experience in it. You are expected to understand basic data structures (such as lists, sets, and trees), algorithms (such as sorting, searching, and tree traversals), recursion, data abstraction, and finite state machine models.

## **Research Survey and Presentation**

Throughout the course, we will introduce a number of testing topics. Many of these topics could easily fill their own courses. Therefore, part of your task for the semester will be to choose one of the topics we are covering and become an expert on it.

Early in the semester, a list of topics will be circulated. You will choose one of these topics and be responsible for writing a 12 page literature survey, summarizing trends and cutting-edge research in that area. This paper will be due at the end of the semester.

During the last week of classes, all students will present their findings in a 12-minute TED-style talk. APOGEE students will be responsible for either presenting in person, presenting live through a screen-sharing or video chat service (Skype/Google Hangouts/etc), or filming their presentation.

## **Homework Assignments and Group Participation**

We will assign several homework assignments throughout the semester. These assignments will be completed in groups of three students. APOGEE students may choose to work on the group projects alone, but are encouraged to form groups with in-class students on the Moodle forum. There will be additional reading and quiz assignments to be completed individually.

You are graded on the quality of the work you produce, not on how many hours a week you spend. The details of how much each deliverable is worth will be announced with the projects and assignments.

You need to pull your weight on all group assignments. Substandard work is obvious to your fellow students and the instructor and will be reflected in your grade. Peer evaluations will be turned in throughout the semester, and will be used during grading.

## **Grading**

Your grade for the course will be calculated from the following components:

- **Group Assignments (45%)**
- **Individual Reading Assignments (15%)**
- **Literature Survey (20%)**
- **End-of-Semester Presentation (10%)**
- **In-Class and Group Participation (10%)**
  - APOGEE students are expected to submit the in-class exercises within seven days of lecture videos being posted, unless prior permission is given.

Students are required to perform satisfactorily on all assignments to receive a passing grade. All assignments will be awarded 100 points. A **general guideline for grading will be the following:**

Total Score	Letter Grade
100 >= score >= 90	A
90 > score >= 87	B+
87 > score >= 80	B
80 > score >= 77	C+
77 > score >= 70	C
70 > score >= 67	D+
67 > score >= 60	D
60 > score >= 0	F

To stream lectures, students will access University Instructional Service's server at <http://video.sc.edu>. From there students click on the section for the College of Engineering and Computing. Each course will be listed along with the list of lectures. At the start of each semester, a password for each course will be generated and distributed to the faculty. Faculty members will pass on the password to all assigned students.

### **3: Policies and Procedures**

This section contains some general rules that will be enforced during this course. Please review these guidelines carefully. The course is governed by the policies in the Carolina Community: Student Handbook & Policy Guide (<http://www.sa.sc.edu/carolinacommunity/judicial/>). Violations of this code can result in actions varying from a failing grade to expulsion from the university.

#### **Integrity and Ethics**

The homework and programs you submit for this class must be entirely your own. If this policy is not absolutely clear, then please contact me. Any other collaboration of any type on any assignment is not permitted. It is also your responsibility to protect your work from unauthorized access.

#### **Classroom Climate:**

All students are expected to behave as scholars at a leading institute of technology. This includes arriving on time, not talking during lecture (unless addressing the instructor), and not

leaving the classroom before the end of lecture. Disruptive students will be warned and potentially dismissed from the classroom.

### **Late Submissions**

Homework assignments are due at the time noted on the assignment handout. Late work is not accepted without prior approval. Any assignment turned in after the due date will be considered late and will be subject to a penalty of 10% per day, including weekends and holidays. Submitting all assignments is a necessary condition for passing this class.

### **Attendance Policy**

This is a graduate level course, and attendance will not generally be checked. However, be aware that the course does have a participation grade. Failing to take part in the in-class activities may result in loss of participation credit. During the presentations at the end of the semester, in-class students must attend class and attendance will be checked.

### **Special Needs**

It is university policy to provide, on a flexible and individual basis, reasonable accommodations to students that have disabilities that may affect their ability to participate in course activities or to meet course requirements. Students with disabilities are encouraged to contact their instructor early in the semester to discuss their individual needs for accommodations.

### **Diversity**

Someday you will graduate, and in the real world, you will have to work with a wide variety of people. Now is the time to abandon preconceived prejudices about others. Students in this class are expected to respectfully work with all other students, regardless of gender, race, sexuality, religion, or any other protected criteria. There is a zero-tolerance policy for any student that discriminates against other students.