

**Spring 2008: IS 698/IS 800**  
**Special Topics in Information Systems**  
**Fundamentals of Software Testing**  
***Syllabus***

**Instructor:** Dr. Sreedevi Sampath

**Office hours:** Tuesdays 1 to 3pm

**Office:** ITE 451

**Email:** sampath@umbc.edu

**Phone:** 410-455-8845 (preferred method of contact is by email)

**Class time:** Thursdays 4.30 to 7p.m.

**Class location:** ITE 239

### **Course Description**

Software is becoming increasingly complex and there is a growing need for systematic strategies for testing and maintaining software. This course will examine the fundamentals of software testing and the main phases in the software testing process. Problems that arise from testing different types of software, such as object-oriented, component-based, concurrent, distributed, Graphical User Interfaces and web software will be discussed, and the relevant program analysis techniques used will be studied. Topics include, but are not limited to, a general overview of the software testing process, approaches to automatic test case generation, test oracles, coverage analysis to decide when to stop testing, test prioritization, mutation testing, and regression testing.

### **Course objectives**

At the end of the semester a student completing the course should have:

- a solid knowledge of the fundamentals and the state of the art in software testing
- a keen awareness of the open problems in software testing and maintenance
- improved skills in reviewing papers critically and identifying open problems
- ability to listen and carefully evaluate a research presentation
- experience in the process of research proposal preparation, from topic identification, through literature review, open problem identification, brainstorming and writing a mini research proposal

### **Required Textbook**

There is no required textbook for this course. We will use research papers as our main source of information. The reading list consisting of research papers will be posted on Blackboard.

### **Reference Textbooks**

- Paul Ammann and Jeff Offutt, **Introduction to Software Testing**, ISBN-13: 978-0-521-88038-1, Cambridge University Press, 2008.
- Mauro Pezze and Michal Young, **Software Testing and Analysis: Processes, Principles and Techniques**, ISBN-13:978-0-471-45593-6, John Wiley and Sons, 2008.

- Robert Binder. **Testing Object-Oriented Systems: Models, Patterns, and Tools**. ISBN-13: 978-0201809381. Addison Wesley, 2000.
- Boris Beizer, **Software Testing Techniques**, 2<sup>nd</sup> edition, ISBN-13: 978-0442206727, Van Nostrand Reinhold, June 1990.

## **Blackboard site**

A Blackboard site will be maintained for the course throughout the semester. It can be accessed through myUMBC or at

**<http://blackboard.umbc.edu>**

The page will contain all project deliverable descriptions, lecture slides, solutions to exams, grades and all announcements pertinent to the course. **Each student is responsible for checking the web page regularly, and for being aware of any information posted there.**

## **Class format and attendance**

Since we have a 2 and a half hour class, the class will be broken into two sessions with a mini-break in the middle.

In each class meeting, after a brief introduction to the topic by the instructor we will cover either one or two papers. The time will be divided as follows:

- Professor's lecture on topic (around 15 minutes)—may not happen every class
- Presentation of paper 1 with interruption for clarification questions as needed (around 40 minutes).
- Questions, discussion points. (around 20 minutes).
- 5 minute break!
- Presentation of paper 2 with interruption for clarification questions as needed (around 40 minutes).
- Questions, discussion points. (around 20 minutes).

Students are strongly encouraged to ask questions and participate in class activities. While attendance is not required, you are strongly encouraged to attend all lectures and participate actively in discussions. Please note that **7%** of your total grade is derived from class participation.

If you miss a class, you are responsible for getting the relevant notes and hand outs to help you prepare for the quizzes and exams. Please come to class on time. Tardiness will affect your class participation grade. There will be in-class discussions and material covered in lectures that will not be available in the research papers and on the Web page. You will be responsible for that material in the exams. You are therefore encouraged to attend all lectures.

In case of inclement weather, check the main UMBC Webpage (<http://www.umbc.edu>) to see whether UMBC is closed and classes are cancelled. In the event of such cancellation on an exam day, the exam will be rescheduled and announced to the students by Dr. Sampath. If there is a deliverable due on that day, there will be no extension for the deliverable. You should still submit the softcopy (in PDF) of your deliverable on time. If the assignment has a hard copy deliverable, the due date for the hardcopy of your deliverable will be automatically be before start of class on the day of the next class.

## Grading

The University's Graduate Catalog states that grades of "A", "B", and "C" are passing and grades of "D" and "F" indicate failure. There is specifically no mention of any numerical scores associated with these letter grades. Consequently, there are no pre-defined numerical boundaries that determine final letter grades. These boundaries can only be defined at the end of the semester after all scores have been earned. At that point, boundaries for final letter grades can be defined such that they conform to the University's and Information System Department's official guidelines. **This means that it is not appropriate to assume that a given numerical score corresponds to a particular letter grade.**

It is also important to understand that final letter grades reflect academic achievement and not effort.

While I am more than happy to correct mistakes in the computation of grades and grade recording errors, in all other situations final letter grades are not negotiable.

A student's grade in this class will comprise of the following components:

- **(30%) Presentation and Discussion** - Students will work in pairs to develop and present 40-minute presentations of research papers to the class, and lead discussions on the paper presented. The number of presentations each student is required to give will depend on the class size and will be decided in the first week of class.
- **(10%) Paper critique (1 per paper)** - After reading a paper, each student will write up a critique of the paper and turn it in to the instructor. This should take no more than 20-30 minutes to complete after reading the paper. Details on how a student should go about critiquing a research paper will be given in class.
- **(28%) Short Research Proposal** - This will be a group assignment with several deliverables due throughout the semester. Some of the deliverables will be group deliverables and some of them will be individual. Possible areas to investigate for research proposal will be suggested by the instructor in the first week of classes. Students are free to choose areas other than those suggested by the instructor, after consulting with the instructor. For this research proposal, students will work in groups (of 2 or 3) to select a software testing research area, conduct literature searches to identify open problems in the area, brainstorm on possible solutions and write a mini proposal that describes the problem and the proposed solution.
- **(25%) Exam** - There will be one exam that will cover the material presented in the classroom and associated readings. The exam will cover material from the beginning of class till the date of the exam (see schedule below). Details on the format and duration of the exam will be provided later in the semester.
- **(7%) Class Participation** - class participation is a subjective evaluation based mainly on the student's active and insightful participation and contribution in classroom discussions and exercises. The student's attendance, punctuality, willingness to seek help from classmates and from me, and the ability to conduct himself/herself appropriately will also affect the class participation grade.

## Getting Help - Questions and Concerns

Email is the BEST way to get in touch with me. I will try to answer your email as soon as possible. When I send out emails to the class on the class list, make sure you are receiving them. **You are encouraged to use your UMBC e-mail account for all e-mail correspondence.**

## **Academic Honesty**

Cheating will not be tolerated in this course. By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of academic dishonesty, and they are wrong. Academic misconduct could result in disciplinary action that may include, but is not limited to a grade of 0 on the relevant assignment, failure of the entire course, suspension, or dismissal. To read the full Student Academic Conduct Policy, consult the UMBC Student Handbook, the Faculty Handbook, or the UMBC Policies section of the UMBC Directory. Every student should read and fully understand the information given at <http://www.umbc.edu/integrity>

In particular, for this course:

- Cheating will not be tolerated on the exams, assignments or project. Cheating includes gaining specific information about the exam before taking it (e.g. in the case of a make-up exam).
- Plagiarism (misrepresenting as your own work any part of the work performed by another person, including Internet sources) applies to the team project in that the team must actually work with a real (not fabricated) customer organization and must not fabricate any information that should come from that organization. Also, no part of any project completed for any other course or any other semester may be used as part of the project deliverables for this course this semester.
- Academic dishonesty also includes interfering with another student's work or aiding another student to commit academic dishonesty.

## **Cell Phones, Beepers, and Other Devices**

All cell phones and beepers must be turned off during class. "Vibrate" mode is acceptable. If you must make a call, please leave the classroom. If you disrupt the class you will be asked to leave the classroom.

## Tentative Schedule (subject to change)

Below is a tentative schedule of lecture topics, exams, and homework due dates. I reserve the right to adjust this schedule for any reason, but I will make every effort to advise you of any changes well in advance. The schedule will be updated on the web page, so please look at it frequently there to make sure you are aware of any changes.

| Week    | Date | Topic   | Presenters | Proposal Deliverables           |
|---------|------|---|------------|---------------------------------|
| Week 0  | 1/31 | Class canceled  |            |                                 |
| Week 1  | 2/7  | Introduction to software testing and the overall testing process              | Dr. S      | Sign up for paper presentations |
|         | 2/8  | <b>Last Day to Add/Drop without a 'W'</b>                                     |            |                                 |
| Week 2  | 2/14 | Test case generation  | Dr. S      | Topic and Group Identification  |
| Week 3  | 2/21 | Test case generation  | Student    | Reference List                  |
|         | 2/25 | <b>Last Day to Change from Regular to Audit</b>                               |            |                                 |
| Week 4  | 2/28 | Test oracles  | Student    |                                 |
| Week 5  | 3/6  | Data flow testing   | Student    | Literature Review Outline       |
| Week 6  | 3/13 | Test coverage   | Student    |                                 |
|         | 3/20 | <b>Spring Break – No Class</b>  |            |                                 |
| Week 7  | 3/27 | Test coverage   | Student    |                                 |
| Week 8  | 4/3  | Mutation Testing  | Student    | Background and Related Work     |
| Week 9  | 4/10 | <b>Exam</b>   |            |                                 |
|         | 4/14 | <b>Last Day to Drop with a 'W'</b>  |            |                                 |
| Week 10 | 4/17 | Test suite reduction  | Student    | Proposed Idea Write up          |
| Week 11 | 4/24 | Test suite reduction  | Student    |                                 |
| Week 12 | 5/1  | Regression testing  | Student    |                                 |
| Week 13 | 5/8  | Regression Testing  | Student    | Final Complete Draft            |
|         | 5/13 | <b>Last Day of Classes</b>  |            |                                 |
|         | 5/14 | <b>Study Day</b>  |            |                                 |
|         | 5/15 | <b>On Final Exam Day, 6 to 8pm</b><br>Student Research Proposal Presentations | All of you |                                 |