

# SYLLABUS: CEN 4072/6070 SOFTWARE TESTING AND VERIFICATION

Spring 2012

**Description:** Software Testing and Verification is a survey course on concepts, principles, and techniques related to software testing and formal program verification. Students will become acquainted with both the strengths and limitations of various functional and structural testing methods, as well as techniques for proving the functional correctness of sequential programs. Topics include: black-box and white-box test case design strategies, incremental integration testing techniques, inspections and reviews, axiomatic verification, predicate transforms, and function-theoretic verification. Students will have the opportunity to practice the techniques presented in class via optional exercises.

## **Prerequisites:**

- (1) Successful completion of an upper division undergraduate or graduate-level software engineering survey course (such as CEN 3031/5035), or comparable professional experience. (Students currently or recently employed as software engineering professionals automatically meet this requirement.)
- (2) Familiarity with programming using a high-level language (C, C++, Java, etc.), and
- (3) Basic knowledge of algorithms, data structures, object-oriented design principles, and discrete math.
- (4) Students who have earned credit for CEN 4072 may NOT take CEN 6070 for credit.

**Note:** item (1) will be strictly enforced. If you do not meet this prerequisite, please plan to do so before enrolling in CEN 4072/6070. See the instructor for additional information.

A self-assessment *pre-test* is available at the course website to assist students in determining their preparedness for the course vis-a-vis coverage of a small subset of prerequisite knowledge.

## **Instructor:**

Steve Thebaut, E314-A, Phone: (352) 505-1564, E-mail: smt AT cise DOT ufl DOT edu  
Office Hours (on-campus students): Tu/Th 4:00-5:00 EST or by appt.

## **Course Meeting Times and Location for On-Campus Students:**

Tuesday: 3rd and 4th (9:35-11:30 AM), Thursday: 4th (10:40-11:30 AM)  
Room: NEB 100 (tentative)

**Course Web Site:** [www.cise.ufl.edu/class/cen6070/sp12.html](http://www.cise.ufl.edu/class/cen6070/sp12.html)

**Course Materials:** Lecture notes will be made available on the course web site in PPT format. A collection of required readings may be purchased as a packet from *Target Copy*, 1412 W. University Avenue, (352) 376-3826. An *optional* textbook, Pezze and Young's *Software Testing and Analysis*, Wiley, 2008, is recommended for students who wish to have additional software testing and analysis reference material at their disposal.

**Examinations and Grades:** Course grades will be based *SOLELY* on two equally weighted 90-minute exams. A histogram of numeric scores will be provided with solution notes for each exam. Course letter grades will be determined at the end of the semester based on separate "curves" for CEN 4072 and CEN 6070 students.

**Exam schedule:** Exam 1: (topics through "Testing Tools" + associated readings) -- Tuesday, February 28 (Out-of-town EDGE students: February 29-March 2); Exam 2: (remaining topics + associated readings) -- Tuesday, April 24 (Out-of-town EDGE students: April 25-27)

**Exam Procedures for Out-of-Town EDGE Students:** Proctors will be instructed to schedule a SINGLE EXAM TIME for all students at each out-of-town site or location during each of the two specified 3-day exam periods. If this is not possible for any reason, students must contact the instructor well in advance to discuss making other arrangements. Proctors should return electronic copies of completed exams via e-mail or FAX directly to the instructor ASAP after administration.

**Make-Up Exam Policy:** Students are expected to be available at scheduled exam times. Do not schedule elective activities (family gatherings, business or interview trips, etc.) that conflict with scheduled exams. If missing an exam is unavoidable (e.g., due to sickness, accident, or other reasons beyond your control), contact the instructor as far in advance as possible. Make-up exams may be administered orally. Note that depending on the circumstances, it may NOT be possible to administer a make-up exam before the end of the term. In such cases, a course grade of "I" (incomplete) may be assigned.

**Outline of Course Topics:** The following topical areas will be covered in the order listed.

Intro to V&V Techniques and Principles	Formal Program Specification
Requirements and Specifications	Axiomatic Verification
Black-Box Test Case Design Strategies	Weak Correctness
Partition Testing	Rules of Inference
Combinatorial Approaches	Strong Correctness
Other Strategies	Predicate Transforms
White-Box Test Case Design Strategies	Proving Strong Correctness
Logic Coverage	Computing Weakest Pre-conditions
Dataflow Coverage	Functional Verification
Path Conditions and Symbolic Evaluation	Complete and Sufficient Correctness
Other Strategies	Axiom of Replacement
Integration and Higher Level Testing	Correctness Conditions
Testing Object-Oriented Software	Iteration Recursion Lemma
Reviews and Inspections	Revisiting Loop Invariants
Testing Tools	Cleanroom Software Engineering

**Problem Sets:** There are 7 non-graded, optional problem sets, covering the areas:

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|---|-----------------------------|
| (1) Black-box Testing                       | (5) Axiomatic Verification  |
| (2) Logic Coverage                          | (6) Predicate Transforms    |
| (3) Dataflow Coverage                       | (7) Functional Verification |
| (4) Path Conditions and Symbolic Evaluation |                             |

Some problems may be non-trivial and/or require the *creative application* of techniques presented in class. You are encouraged to work on the problem sets either alone or in groups, and to meet with the TA and/or instructor to discuss your work as desired. Problem set introductions, discussions, hints, and solution reviews will be provided in class. Note that exams assume a *thorough* understanding of the problem sets and their solutions.

**Class Attendance Policy:** Students are expected to view all recorded lectures and are responsible for any recorded announcements made in class. On-campus students are encouraged, but NOT required, to attend live lectures.

**Computer Facilities:** Access to e-mail and the WWW is required.

**Academic Integrity:** All students admitted to the University of Florida have signed a statement of academic honesty committing themselves to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a UF student and to be honest in all work submitted and exams taken in this course and all others.

You will be asked to sign the following statement on both exams in this course: *On my honor, I have neither given nor received unauthorized aid on this exam and I pledge not to divulge information regarding its contents to those who have not yet taken it.*

**Accommodation for Students with Disabilities:** Students requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

**UF Counseling Services:** Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

- University Counseling Center, 301 Peabody Hall, 392-1575: personal and career counseling.
- SHCC Mental Health, Student Health Care Center, 392-1171: personal and counseling.
- Center for Sexual Assault/Abuse Recovery and Education (CARE), Student Health Care Center, 392-1161: sexual assault counseling.
- Career Resource Center, Reitz Union, 392-1601: career development assistance and counseling.

**Software Use:** All faculty, staff and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

**Instructor Biography:** Steve Thebaut received the BA in Mathematics from Duke University in 1977, and the MS and PhD in Computer Science from Purdue University in 1979 and 1983, respectively. He is currently Associate Chair of the CISE Department. Dr. Thebaut's research interests include software requirements engineering, testing and verification, and software engineering technology transfer. He has received funding from the National Science Foundation, IBM, the Florida Department of Education, the Florida High Technology and Industry Council, the Sino-Software Research Center at HKUST, the Software Engineering Research Center, and the Software Engineering Institute (SEI) at Carnegie Mellon University, where he was an invited lecturer in the SEI production of "Software Project Management," a nationally distributed video-based continuing education course. He has been a course developer and consultant for IBM's IS&PG Technical Education program, and has served on the program committee of the Conference on Software Engineering Education. He was Associate Editor of the International Journal of Computer and Software Engineering from 1990-1996.