

ECE40097 Special Topic-Software Testing and Debugging

# Course Overview

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# Course Objective

- equip the theoretical and the practical basis to understand software testing and debugging techniques
- introduce the recent topics in automated software testing and debugging techniques and the research on them

# Course Outlines

- Two modules
  1. basic concepts of software testing, theoretical backgrounds (8 weeks)
  2. techniques for automating software testing and debugging (8 weeks)
- Lab sessions
  - once every three classes (total 10 labs)
  - two-persons teamwork
  - the team must submit the lab result within two days
- Reading assignments
  - As we cover the second module, one or two research papers will be given as reading assignments every week

# Topics and Class Schedule

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Week	Topics
1	Course Introduction, Why SW Testing Matters, SW Bugs
2	SW Requirements, SW Testing Basics
3	<u>Lab 1-Writing Test Driver</u> , Input-domain modeling (blackbox testing)
4	<b>**National Holiday**</b> Structural Testing
5	<u>Lab 2-Combinatorial Interaction Testing</u> Logic Coverage
6	Data-flow Coverage Source-code Engineering with srcML,
7	<u>Lab 3-MC/DC Coverage</u> Quick Overview of Computation Theory,
8	Unit Testing Basics <u>Lab 4-Turing Machine</u>

Week	Topics
9	<u>Lab 5-Unit Test Augmentation</u> , Regression Testing Techniques
10	Mutation Testing, <u>Lab 6-Test Case Prioritization</u>
11	Symbolic Execution, <u>Lab 7-Concolic Testing with CREST</u>
12	Greybox Fuzzing
13	<u>Lab 8-AFL &amp; libFuzzer</u> , Slicing, Delta debugging
14	Fault localization, <u>Lab 9-Automated Debugging</u>
15	Multithreaded Program Testing, <u>Lab 10-Dynamic Data Race Detection</u>
16	Guest lecture: TBD

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# Evaluation

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- For each lab result, you may receive up to 10 points
  - 8 points if the result complete all basic tasks
  - peer evaluation result is considered
- Discussion points will be counted for every class participation and given up to 10 in the final score
- You will receive Pass only if you get more than 70 point in the final score
  - top-30% may receive Pass with Distinction
- You will receive Fail for each of the following cases:
  - do not attend more than 4 classes
  - conduct any form of academic dishonesty or violation, or any attemptation of such activities
  - do not participiate in the teamwork for a lab session

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# Class Policies

- The official communication channel is Slack
- All classes will be conducted as onsite-online parallel
  - online attendee must be always fully equipped and readily available in classtime for realtime interaction
- Approved absent is allowed if your case is of what's listed in Act 8-34 of the HGU rule
  - COVID-19 vaccination is counted as an approved absent case
- Students with low participation in labs and classes receive a warning, and, if continued, they will be cut off from the class