

**CEN 6070 – Software Verification (Spring 2010)**  
**ECS 141, 12:30 – 1:45pm Tuesday & Thursday**

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Office Hours: 2:00– 4:00 pm (T & Th) or by appointment

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**Course Objective:**

Students, after taking this course, are expected to know the benefits of formal verification in the software development process, and to understand a variety of formal verification methods and their applicability. Furthermore, students are expected to learn several well developed formal verification methods for both sequential and concurrent software systems and be able to apply them to verify small benchmark systems. In particular, this course will cover the new verification paradigm of modeling checking, which has become the focal research area in the past decade and has become very successful in industrial applications. Several well-established model checking techniques will be studied. Further research issues with regard to overcoming the limitations and improving the efficiency of modeling checking will be discussed.

**Prerequisites:**

Undergraduate level mathematics: discrete mathematics (set theory, logic, algebra) and advanced software engineering (CEN 5011).

**Text:** Model Checking (3<sup>rd</sup> printing) by Edmund Clarke et al, The MIT Press 2001.

**Material:**

This course uses materials from other sources including books on software verification and papers from software engineering related journals and conference proceedings.

**Requirements:**

There will be 5 homework assignments. Homework will be assigned every 2 weeks. Each homework assignment should be turned in at the end of class on the due date. Late homework turned in before the next lecture will receive partial credit. Homework assignments need to be typed.

**Exams:** There will be two exams on Feb. 18, and April 15, respectively.

**Grading:** 50% (Assignments) + 50% (Exams) = 100%

**Tentative Schedule:**

Week 1: The Fundamentals of Software Verification (Chapt. 1)

Week 2: The Basic Concepts of Model Checking Paradigm (Chapt. 1 & 2)

Week 3 – 4: Temporal Logics CTL\* (Chapt. 3 & 4)

Week 5: Binary Decision Diagram (Chapt. 5)

Week 6: Symbolic Model Checking (Chapt.6)

Week 7: Model Checking for the  $\mu$ -Calculus (Chapt. 7)

Week 8: Model Checking in Practice (Chapt. 8)

Week 9: Model Checking and Automata Theory (Chapt. 9)

Week 10: Partial Order Reduction (Chapt. 10)

Week 11: Equivalence and Preorders between Structures (Chapt. 11)

Week 12: Compositional Reasoning (Chapt. 12)

Week 13: Abstraction (Chapt. 13)

Week 14: Symmetry (Chapt. 14)

Week 15: Infinite Families of Finite State Systems (Chapt. 15).