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Phone: 619.594.2726
Office: E-403H
Office hours: M & W 4:00pm – 5:30pm

Course Info:

Schedule: MW 5:30pm - 6:45pm
Location: P-147

Test I: September 28, 2016
Test II: October 31, 2016
Test III: December 12, 2016

Prerequisites: Electrical Engineering 440 and Computer Engineering 572.

Catalog Description: Interconnect and power distribution network design in very-large scale integration systems packaging. High-speed transmission lines and crosstalk, macromodeling of interconnects. Switching noise, decoupling, numerical methodologies in power integrity design.

Credits: 3


Course Learning Outcomes:

By the end of this course, students should be able to

1. Understand the trends in high-speed digital systems that make signal and power integrity analysis necessary.
2. Simulate a digital link including models for I/O buffers, package parasitics, and transmission lines.
3. Identify the impact of various components on the performance of the power distribution network.
4. Apply numerical techniques for power integrity simulation.
5. Quantify and minimize various coupling mechanisms that create simultaneous switching noise.
6. Create macromodels of interconnects and transmission lines for time-domain simulation.

Topics Covered:

4. IC packaging: Applications and future of microelectronics packaging including 3D IC integration technology.

Course Outline:

Approximately one week for each of the following topics:

1. Introduction to signal and power integrity
2. Decoupling capacitors and other components of a power distribution network
3. Bandwidth of digital signals, introduction to multi-port networks
4. Power distribution network impedance, antiresonance, measurement techniques
5. Lumped and distributed models for power/ground planes
6. Power/ground plane simulation using finite-difference method
7. Noise coupling in multilayered planes
8. Modeling of transmission lines in time and frequency domain
9. Frequency-dependent behavior of conductor and dielectric loss in transmission lines
10. Cross talk in coupled transmission lines
11. Return currents in transmission lines, vias, simultaneous switching noise
12. Macromodeling of interconnects
13. Causality, stability, and passivity of macromodels
14. Advanced applications: Embedded capacitors, electromagnetic bandgap structures, 3D ICs

Course Policies:

1. Proof of prerequisite is due by the end of the first week.
2. Students without the proof of prerequisite will be dropped from the course in the second week of the semester.
3. Student conduct which disrupts the learning process, e.g. cell phone ringing, shall not be tolerated and may lead to disciplinary action and/or removal from class.

4. Assignments and announcements will be given via the Blackboard.

5. Almost every week a homework assignment will be given via the course website.

6. No late homework assignment will be accepted.

7. All exams (midterms and final) are closed note.

8. You may use a calculator in the exams.

9. To make up a midterm or the final exam, you need to have an acceptable excuse, such as family emergency with supporting documents to prove it. You should notify me before the exam by sending me an email. No excuse will be accepted after the exam.

10. A make-up exam may be different from the scheduled exam.

11. The final grade will be determined based on the overall performance of the class.

12. This syllabus is subject to change in the event of extenuating circumstances. If you are absent from class, it is your responsibility to check on announcements made while you were absent.

13. If you are a student with a disability and believe you will need accommodations for this class, it is your responsibility to contact Student Disability Services at (619) 594-6473. To avoid any delay in the receipt of your accommodations, you should contact Student Disability Services as soon as possible. Please note that accommodations are not retroactive, and that accommodations based upon disability cannot be provided until you have presented your instructor with an accommodation letter from Student Disability Services. Your cooperation is appreciated.

**Academic Misconduct:**

Academic misconducts such as cheating, plagiarism falsifying records and data, etc., will not be tolerated. Students who cheat will receive an "F" for the course grade and will be reported to the Center for Student Rights and Responsibilities. For further information visit the website of Center for Student Rights and Responsibilities at: http://csrr.sdsu.edu/.

**Grading Percentage:**

Homework assignments: 20%
Test I, II, and III: 20% each
Projects: 20%