ECE 4431 - Vehicluar Power System and Loads

Fall 2011

N. Natarajan and C. Mi

216 ELB
nnarasim@umd.umich.edu; chrismi@umich.edu

Catalog Description

This is an introductory course on power systems and load analysis with focus on automotive applications. The objectives are to familiarize the students with the basic principles and concepts of vehicular power systems and loads. Students are expected to be able to analyze and design basic vehicular power systems. The topics covered in this course include an overview of power systems, vehicular power system architecture, DC and AC power grid in vehicular systems, power system stability, reliability, reactive power control, load flow analysis, short circuit analysis, and vehicular power system protection. Four lecture hours per week.

Prerequisite material

- Circuit analysis
- Physics: Electricity and Magnetism
- Calculus and differential equations
- Complex numbers

Grading

Homework: 20%
Midterm Exam: 30%
Final Exam: 30%
Final Report/Presention: 20%

Academic Code of Conduct (Make sure you read this!)

campus statement

The University of Michigan - Dearborn values academic honesty and integrity. Each student has a responsibility to understand, accept, and comply with the university's standards of academic conduct as set forth by the Code of Academic Conduct, as well as policies established by the schools and colleges. Cheating, collusion, misconduct, fabrication, and plagiarism are considered serious offenses. Violations will not be tolerated and may result in penalties up to and including expulsion from the University.

College of Engineering statement

The Academic Code of Conduct (ACC) of the College of Engineering and Computer Science is based on the premise that all students in the college will perform honestly and ethically in all graded tests, projects and assignments. The CECS Academic Disciplinary Committee is a group consisting of dedicated faculty members and students.
Academic Code of Conduct and procedures for handling cases involving violations

Lesson Plan

Date	Topic	Comments
L1	Introduction to the course. Review of prerequisite materials	
L2	DC circuits, concept of power, power calculations, AC circuits	
L3	Sinusoidal signals, complex exponentials, phasors, real and reactive power, power factor, complex impendance, impedance of resisors, capacitors and inductors, AC circuits	
L4	three phase system, three phase relationships, phase and line-to-line quantities, WYE and DELTA balanced sources/loads, WYE-DELTA transformations	Last day to drop w/o penalty
L5	Completion of power system devices: Transformers, AC generators, Loads, per-unit system, sample calculations with and without per unit system	

L6	Overview of Hybrid Electric vehicles (HEV) and Fuel cell vehicles (FCV): Series HEV, Parallel HEV, Series-Parallel HEV, Fuel Cell vehicles, power management and control of HEV and FCV	
L7	== Continued ===	
L8	Power flow Analysis	Last day to drop with 50% penalty
L9	Power flow Analysis	
L1	Economic dispatch	
L11	Economic dispatch	
L12	Slack	
October 25, 2011	**Midterm Exam**	
L13	Stability - Small signal	
L14	Stability - Large Signal	
L15	Stability - Large Signal	Last day to drop with 75% penalty
L16	Protection / short circuit studies	
L17	Slack	
L18	Power electronics and electric vehicles	
L19	Power electronics continued	
L20	Battery technologies	
L21	Battery technologies	
L22	Thanksgiving Holdiday	
L23	Case Study: Prius Hybrid	
L24	Case Study: Prius Hybrid	
L25	Student presentations	
L26	Student presentations	
December 13, 2011	Student presentations	Classes end. Last day to drop ALL courses with 100% penalty