

FLORIDA STATE UNIVERSITY / FLORIDA A&M UNIVERSITY
Department of Electrical and Computer Engineering

Fall 2019
EEL4930/EEL5930

Advanced Power Electronics

College of Engineering B-214
Mo/We, 3:30 PM – 4:45 PM

Instructor: Prof. Jinyeong Moon
CoE B-368
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Schedule: Class
Mo/We 3:30 PM – 4:45 PM @ CoE B-214
Office Hours
Mo/We 2:00 PM – 3:15 PM @ CoE B-368

Course Topics

- (1) Energy Method for Loss Calculation (3 Lectures)
- (2) Switched Capacitor Converters (5 Lectures)
- (3) Duality (2 Lectures)
- (4) Magnetics Design (12 Lectures)
 - a. Core Factor & Core Area Product
 - b. Magnetic Diffusion
 - c. Winding Loss
 - d. Core Loss
 - e. Transformer Modeling
 - f. Magnetic Circuit
 - g. Magnetic Saturation
- (5) Topologies (5 Lectures)
 - a. Coupled Filters
 - b. Parasitic Cancellation
 - c. Ripple Steering
 - d. Integrated Magnetics
 - e. Interleaving

Prerequisite

EEL3111 Circuit Analysis
EEE3300 Electronics
EEL4243/EEE5317 Power Electronics

Subject Reading

The principal sources for this course will be lecture notes and classic and recent papers on power electronics and related areas. The following textbooks might prove helpful:

- 1) Fundamentals of Power Electronics, Second Edition, By Erickson and Maksimovic
- 2) Principles of Power Electronics, By Kassakian, Schlecht, and Verghese
- 3) Elements of Power Electronics, By Krein
- 4) Modern DC-to-DC Switchmode Power Converter Circuits, By Severns and Bloom
- 5) Basic Circuit Theory, By Desoer and Kuh
- 6) Electromagnetic Fields and Energy, By Haus and Melcher

Grading

Class Attendance and Quiz Performance (10%), Homework (20%), Midterm (30%), Final (40%)
A = 90 ~ 100; B = 80 ~ 89; C = 70 ~ 79; D = 60 ~ 69; F = < 60

Homework assignments will be issued periodically, and due dates will be specified in each assignment.

Policy Statements

- Attendance is mandatory. Coming late or leaving early will be considered as the absence of class. Missing one class will result in a grade drop of 1 %.
- Homework is due at the beginning of class.
- The general policy is no makeup exams and quizzes. In the event of an excused absence, you must notify the instructor prior to the exam to discuss proper procedure.
- Any electronic device, including a **cell phone**, must be **completely silent** (no sound, no vibration).
- Grade dispute must be made within one week after the graded work has been returned to the student.

Academic Honor Code

Students are bound by their university's Academic Honor Code and are subject to sanctions if they are found in violation of the Code. Possible sanctions include but are not limited to: (1) a failing grade on an exam or assignment; (2) a failing grade in the course; (3) dismissal from the academic program; or (4) dismissal from the university.

Americans with Disabilities Act

Students with disabilities needing academic accommodation should:

- (1) Register with and provide documentation to the appropriate university office.
For FAMU students, this is the Learning Development and Evaluation Center (LEDC).
For FSU students this is the Student Disability Resource Center (SDRC); and
- (2) Bring a letter to the instructor indicating the need for accommodation and what type. This should be done during the first week of class.

Syllabus Change

Except for changes that substantially affect implementation of the grading policy or grading scale, the syllabus is a guide for the course and is subject to change with advance notice.

| Tentative Lecture Schedule: EEL4930/5930 - Advanced Power Electronics (2019 Fall) | | | | |
|---|-----|---------|-----------------------------------|----------------|
| Date | Day | Lecture | Topics | Homework |
| 08/26 | Mo | 1 | Energy Method | |
| 08/28 | We | 2 | Energy Method | HW #1 out |
| 09/02 | Mo | | No class - Labor Day | |
| 09/04 | We | 3 | Switched Capacitor Converter | |
| 09/09 | Mo | 4 | Switched Capacitor Converter | HW #2 out |
| 09/11 | We | 5 | Switched Capacitor Converter | |
| 09/16 | Mo | 6 | Switched Capacitor Converter | HW #3 out |
| 09/18 | We | 7 | Switched Capacitor Converter | |
| 09/23 | Mo | 8 | Duality | HW #4 out |
| 09/25 | We | | Midterm Review | |
| 09/30 | Mo | | No class - Prof's Conference | |
| 10/02 | We | | Midterm Exam | |
| 10/07 | Mo | 9 | Core Factor and Core Area Product | |
| 10/09 | We | 10 | Magnetic Diffusion | HW #5 out |
| 10/14 | Mo | 11 | Magnetic Winding Loss | |
| 10/16 | We | 12 | Magnetic Winding Loss | HW #6 out |
| 10/21 | Mo | 13 | Magnetic Core Loss | |
| 10/23 | We | 14 | Magnetic Core Loss | HW #7 out |
| 10/28 | Mo | 15 | Transformer Modeling | |
| 10/30 | We | 16 | Transformer Modeling | HW #8 out |
| 11/04 | Mo | 17 | Magnetic Circuit | |
| 11/06 | We | 18 | Magnetic Circuit | HW #9 out |
| 11/11 | Mo | | No class - Veterans' Day | |
| 11/13 | We | 19 | Magnetic Saturation | |
| 11/18 | Mo | 20 | Coupled Filters | |
| 11/20 | We | 21 | Parasitic Cancellation | |
| 11/25 | Mo | 22 | Ripple Steering | HW #10 out |
| 11/27 | We | | No class - Thanksgiving | |
| 12/02 | Mo | 23 | Integrated Magnetics | |
| 12/04 | We | 24 | Interleaving | |
| 12/09 Mo - 12/11 We | | | Final Exam Week | Ver. 8/12/2019 |