Carleton University

Department of Electronics

Summer 2025

ELEC5200 F: Advanced Topics in Integrated Circuits and Devices: Electrical Distribution Systems

Introduction

In this course you will learn the fundamentals and state-of-the-art technologies of electrical power systems, including power system basics, advanced power system stability analysis and control, distribution system basics, feeder topologies, load characteristics, machine learning based load predictions, distribution automation, communication systems for distribution systems, distribution system performance and operation, distribution system planning, distribution system control, and smart grid technologies.

Course Description and Requirements

Course Description: topics vary from year to year.
Prerequisite(s): N/A
Lectures: 6 hours per week
Laboratory and problem analysis: N/A

Instructor

Professor: Shichao Liu
Email: shichaoliu@cunet.carleton.ca
Course Webpage: on Brightspace

Textbook: No

1) Course lecture notes and slides

2) Supplementary references:

[1] Prabha Kundur, Power System Stability and Control, McGraw-Hill, 1994.[1] Prabha Kundur, Power System Stability and Control, McGraw-Hill, 1994.

[2] Jan Machowski, Janusz Bialek, Jim Bumby, Power System Dynamics: Stability and Control, Second Edition, Wiley, 2008

[3] T K Nagsarkar and M S Sukhija, Power system analysis, 2nd edition, Oxford Higher Education, 2014.

[4] J D Glover, M S Sarma, and T J Overbye, Power System Analysis and Design, 5th Edition, Cengage Learning, 2012

[5] Control and Automation of Electrical Power Distribution Systems, James Northcote-Green and Robert Wilson, CRC Press.

ISBN: 978-1-4200-1484-6 (eBook - PDF)

[6] Power Distribution Planning Reference Book, H. L. Willis, Marcel Dekker, Inc.

ISBN: 0-8247-4875-1 (Print Edition)

Lecture Outline

In person, Date & Time
The following topics will be covered during the course lectures with an approximate schedule:
Week 1: Electrical Power System Structure, Stability, and Control Basics
Week 2: Electrical Power System Calculations and Power Flow Analysis
Week 3: Electrical Power System Steady-State Model and Control
Week 4: Electrical Power System Small-Signal Model and Stability
Week 5: Electrical Distribution System Topology, Load Characteristics and Load Prediction
Week 6: Electrical Distribution System Automation and Voltage Regulation

Laboratory and Problem Analysis Sessions

- No

Self-Declaration form and Deferred Term work

Students who claim illness, injury or other extraordinary circumstances beyond their control as a reason for missed term work are held responsible for immediately informing the instructor concerned and for submitting a self-declaration form no later than three (3) days after the date/deadline of term work including test/midterm, labs, assignments. Any alternate arrangements made with the instructor for submission of term work should be made as soon as possible but within 3 days of the missed due date. If this is not possible after discussion with the instructor, alternate arrangements must be made before the last day of classes in the term as published in the academic schedule.

> **Contact the instructor with the completed self-declaration form no later than 3 days after the date/deadline of term work including test/midterm, labs, assignments.**

Evaluation and Grading Scheme

The cumulative course grade will be determined as follows:

Midterm: in-person, closed book, in-class----------30%

Project: Deep Learning Based Load Predictions----------20%

Final Exam: open-book, take-home exam----------50%

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a) Final Exam: **Final exams are for evaluation purpose and will not be returned to students.**

i) take-home and open-book

ii) Final exam weight [Summer 2025]: 50%

iii) Deferred Final Examinations

Students who are unable to write the final examination because of a serious illness/emergency or other circumstances beyond their control may apply for accommodation by contact the Registrar's office. Consult the Section 4.3 of the University Calendar (https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/examinations/)

b) Exam format and e-proctoring statement

The final exam will be a take-home exam.

Academic Accommodations

Pregnancy obligation: Contact us with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For accommodation regarding a formally-scheduled final exam, you must complete the Pregnancy Accommodation Form (click here).

Religious obligation: Contact us with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details click here.

Academic Accommodations for Students with Disabilities: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send us your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, contact us, if needed, to ensure that accommodation arrangements are made.

You should request your academic accommodations in the Ventus Student Portal, for each course at the beginning of every term. For in-term tests or midterms, please request accommodations at least two (2) weeks before the first test or midterm.

Please consult the PMC website for the deadline to request accommodations for formally-scheduled exams (if applicable).

Survivors of Sexual Violence: As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and where survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: https://carleton.ca/equity/sexual-assault-support-services

Accommodation for Student Activities: Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation will be provided to students who compete or perform at the national or international level. Contact us with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist: https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf