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): experiences on taking courses such as power system analysis/power system control or equivalent ones.
Lectures: 3 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) Students are not required to purchase textbooks or other learning materials for this course. Course lecture notes and slides are sufficient.

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
The following topics will be covered during the course lectures (Tentative):
1: Electrical Power System Structure, Stability, and Control Basics
2: Electrical Power System Calculations, Power Flow Analysis, DC Power Flow, and Optimal Power Flow
3: Electrical Power System Steady-State Model and Control
5: Electrical Distribution System Topology, Load Characteristics and Load Prediction
6: Electrical Distribution System Automation and Voltage Regulation
7: Electrical Distribution System Reliability
8: Electrical Power System State Estimation
9: Microgrids

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--20%

Essay and Presentation---10%

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

Final Exam: closed-book, formally schedule by Exam and Schedule department-------------------------50%

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

    i) Closed book and fixed time

    ii) Final exam weight [Fall 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

b) Exam format and e-proctoring statement

    In person.

Academic Accommodations

Carleton is committed to providing academic accessibility for all individuals. You may need special arrangements to meet your academic obligations during the term. The accommodation request processes, including information about the Academic Consideration Policy for Students in Medical and Other Extenuating Circumstances, are outlined on the Academic Accommodations website (students.carleton.ca/course-outline).

Use of Course Materials

Classroom teaching and learning activities, including lectures, discussions, presentations, etc., by both instructors and students, are copy protected and remain the intellectual property of their respective author(s). All course materials, including PowerPoint presentations, outlines, and other materials, are also protected by copyright and remain the intellectual property of their respective author(s). Students registered in the course may take notes and make copies of course materials for their own educational use only. Students are not permitted to reproduce or distribute lecture notes and course materials publicly for commercial or non-commercial purposes without express written consent from the copyright holder(s).

AI Use in this course

Students may use AI tools for basic word processing and formatting functions, including:

• Grammar and spell checking (e.g., Grammarly, Microsoft Word Editor)

• Basic formatting and design suggestions (e.g., Microsoft Word's formatting tools, PowerPoint Design editor)

Documenting AI Use: It is not necessary to document the use of AI for the permitted purposes listed above.

As our understanding of the uses of AI and its relationship to student work and academic integrity continue to evolve, students are required to discuss their use of AI in any circumstance not described here with the course instructor to ensure it supports the learning goals for the course.