Spring 2018 ECE 565* Electrical Power Engineering

Instructor: Prof. Siddharth (Sid) Suryanarayanan
Office hours: F 10:00AM–12:00 PM in B116, Engineering Building
Other times by appointment only
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Lecture time and venue: R 5:15–8:00 PM, Room: B4, Engineering Building
Online/distance link: accessible via Canvas

Textbook: J. D. Glover, T. J. Overbye, M. S. Sarma, Power system analysis and design, **6th Ed.**, CL Engineering, 2017. (ISBN-10: 1305632133)
Link for Etextbook (180 day rental): `https://goo.gl/nkmf4G`
Notes and technical papers will be supplied by the instructor as deemed fit

Link for downloading PowerWorld^{TM}simulator and associated files: `https://goo.gl/V3OOwa`

Prerequisites: †ECE332, ECE342, and familiarity with electric power systems, such as covered in ECE461.

Course description: Analysis of power systems in terms of current, voltage, and active/reactive power. Introduction of computer-aided tools for power systems.

Course objectives: This graduate-level course is designed to provide a review of computational and computer tools used in electric power engineering for the purpose of understanding and computing the power flows in the electricity grid. The emphasis of the course is on topics related to power flow algorithms, fault studies, and system planning and design. A popular commercial software package will be used in the course. 2 hours lecture; 1 hour (computer) laboratory; 3 semester hours.

In this course students will:

- Recall the use of fundamental concepts of circuit theory and basic power systems analysis topics such as per units and transformations
- Understand the need for computer applications for analysis of large power systems
- Apply concepts from matrix algebra and differential calculus to conduct studies in power systems
- Develop the framework for conducting power flow, economic dispatch, and fault studies in power systems
- Evaluate the different cases of faults in power systems
- Create original computer models for conducting the above mentioned studies

Assignment of course grade: The grade will be based on the weighted index as shown below.

Homework assignments	20 %
Project 1	20 %
Project 2	20 %
Project 3	20 %
Project 4	20 %

†OR instructor's approval.

Course Outline: Tentative schedule [‡]

Week 1	1/18/18	Refresher: per unit system, real & reactive power, and symmetrical components
Week 2 & Week 3	1/25/18 & 2/1/18	Direct and iterative methods of numerical solutions
Week 4 & Week 5	2/8/18 & 2/15/18	The power flow algorithm
Week 6 & Week 7	2/22/18 & 3/1/18	Control of real and reactive power flow
Week 8	3/8/18	Symmetrical fault studies
Week 9	3/15/18	*Spring break*
Week 10	3/22/18	Symmetrical fault studies (contd.)
Week 11	3/29/18	Unsymmetrical fault studies (single line-ground, line-line faults)
Week 12	4/5/18	Unsymmetrical fault studies (double line-ground faults)
Week 13	4/12/18	Fuses and circuit breaker selection
Week 14	4/19/18	Economic dispatch and Optimal power flow
Week 15	4/26/18	Local control, central control, and area control error
Week 16	5/3/18	Emerging trends and challenges

Course Policy:

Attendance: **Regular attendance for in-class students is strongly encouraged**. In specific, this course will include a frequently assigned (weekly) reading assignment that typically requires studying the course material equivalent to a book chapter, which includes reading and understanding the theoretical narrative of the text and relating this material to the class lectures, performing independently (by the student) the associated derivations from the textbook, and carrying out independently (by the student) the examples (worked-out problems and exercises) from the textbook and/or reference sources. The reading assignments are essential for the successful and efficient performance on projects and class participation, and as such are evaluated and assessed through all assessed/graded items included in the course outline.

Canvas use policy: The instructor will exclusively use the Canvas facility to communicate with the individual and the class regarding the course. So, it is imperative that the student has a functioning email (usually it is the colostate.edu email id) associated with the Canvas website to receive all notifications. The instructor does not take any responsibility for sending information to students via any other means or to another email id than the one associated with Canvas.

Make-up: Except under documented cases of extenuating circumstances, there will be no opportunity for a make-up for any portion of the class component towards the final grade.

ADA Statement: Students with disabilities are encouraged to register with the Office for Student Services to determine the appropriate classroom accommodations. Any student with verification of a disability should contact the instructor as soon as possible, and will be accommodated in an appropriate manner.

[‡]The instructor may be on business-related travel on some of the lecture dates (**TBD**). In such cases of a conflict in schedule, the respective class will be recorded sans audience and made available via the class URL on Canvas or delivered by a substitute instructor. In rare cases, the lecture may be canceled.

Projects & homework assignments: Students will be required to perform four projects during the length of this course that will feature extensive use of Matlab^{TM} or a similar software (for Project 1) and a commercially-used power systems analysis software, PowerWorld^{TM} (for Projects 2-4). Eight homework assignments will be assigned periodically with the objective of helping the student gain expertise in solving the projects. Project and homework submissions are through Canvas only. No other form of submission will be accepted for grading. Tardy and illegible work will **not** be graded. Directly copying another student's (from this class or another) work or from any other source without proper referencing is considered plagiarism and a proceeding of lapse of academic integrity will be pursued against the violating student.

Project number	Assigned	Due
1	Week 2	Week 5
2	Week 5	Week 8
3	Week 8	Week 13
4	Week 13	Week 16

Academic Honesty: Academic integrity is of utmost importance. For a description on practicing academic integrity, go to: `http://tilt.colostate.edu/integrity/` Departures from accepted norms of academic integrity will be dealt with full compliance to CSU policies.

Colorado State University's Writing Center defines plagiarism as "the unauthorized or unacknowledged use of anoth-er person's academic or scholarly work. Done on purpose, it is cheating. Done accidentally, it is no less serious. Regardless of how it occurs, plagiarism is a theft of intellectual property and a violation of an ironclad rule demanding credit be given where credit is due."

Departures from accepted norms of academic integrity will be dealt with full compliance to CSU principles published in the CSU General Catalog (see page seven, column two: `http://www.catalog.colostate.edu/front/policies.aspx`).

The instructor may use a source/tool authorized by Colorado State University for the verification of plagiarism in any work that is submitted by a student for grade in the ECE565 course.

Visit `http://tilt.colostate.edu/integrity/honorpledge/` for familiarizing with the CSU Honor Pledge.