ECE550 Course Syllabus

POWER SYSTEM OPERATION AND CONTROL

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INSTRUCTOR INFORMATION

Name	Office Phone	Mobile Phone	Email	Office Location
Mesut Baran	919.515.5081		baran@ncsu.edu	FREEDM System Center

Office Hours: *Tues 3-4 or by appointment.*

Preferred Method of Communication: Moodle Forum Response Time: 1 day

COURSE INFORMATION

Course Website: https://wolfware.ncsu.edu/courses/my-wolfware/
Course Credit Hours: [3]

Prerequisites/Corequisites: ECE 305, 308; or Equivalent

COURSE OVERVIEW

Catalog Description: Fundamental concepts of economic operation and control of power systems. Real and reactive power balance. System components, characteristics and operation. Steady state and dynamic analysis of interconnected systems. Tieline power and load-frequency control with integrated economic dispatch.

Structure

This course delivers all learning materials, activities, and assignments, through **Moodle**, a secure and easy-to-use online learning platform.
- Learning activities include reading assignments, quizzes, videos, narrated PowerPoint presentations, discussion forums, and a term project.
- This course consists of 6 main chapters/modules. Most modules last two weeks.

LEARNING OUTCOMES

Upon completion of this course, students will be able to:
• Develop equivalent circuits for a given power system for power flow analysis,
• Develop computer programs to perform power flow analysis on a power system,
• Define automatic generation control scheme on a power system and analyze generation control on a power system using simulation tools,
• Define generation dispatching on a power system and develop generation dispatching schemes using analysis packages,
• Define real time monitoring requirements on a power system,
• Define State Estimation problem and analyze state estimation of a power system using analysis programs,
• Define contingency analysis on a power system and perform contingency studies using a power flow analysis program.

COURSE SCHEDULE

Week	Chapter	Topic
1	1	Operation and Control of Power Systems
2-4	2	Modeling of system components
5-7	3	Steady-State Power Flow Analysis
		- Formulation
		- Solution Methods
		- LTC control, generator limits
8		Midterm Exam
8-9	4	System Security - Contingency Analysis
10-12	5	Real-Time Generation Control
		- Automatic Generation Control
		- Economic Dispatch
13	6	System Voltage Control
14-15	7	Real-Time Monitoring - State Estimation
		- Formulation
		- Solution

Please note: course schedule is subject to change.

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COURSE MATERIALS

Required Textbook

Power System Analysis, Hadi Saadat, McGraw-Hill

Optional Materials

Power System Analysis, John, J. Grainger & W. D. Stevenson, McGraw-Hill.
Power Generation, Operation, and Control, by A. Wood.
Power Systems Analysis, Arthur R. Bergen, Prentice-Hall

TECHNOLOGY REQUIREMENTS

Hardware

NC State's Online and Distance Education provides [technology requirements and recommendations](#) for computer hardware.

Software

- ➤ [Moodle and Wolfware](#)
  - ○ [Moodle Accessibility Statement](#) [Moodle Privacy Policy](#) [NCSU Privacy Policy](#)

- ˃ [Zoom](#):
  - ○ [Zoom Accessibility Statement](#) [Zoom Privacy Policy](#)

- ˃ [G Suite](#)
- ˃ Headsets with microphone (optional for synchronous events)

- ˃ Matlab

Minimum Computer and Digital Literacy Skills

- ˃ Obtain regular access to a reliable internet connection.
- ˃ Ability to use online communication tools, such as email (create, send, receive, reply, print, send/receive attachments), discussion boards (read, search, post, reply, follow threads), chats, and messengers.
- ˃ Internet skills and ability to perform online research using various search engines and library databases. Visit [Distance Learning Services](#) at NC State Libraries for more information.

GRADING

Grading Policy

Homework	20%
Term Proj.	20%
Quiz	30%
Final	30%.

> There will be about 6 homework assignments. Each question is worth 10 points. Homework assignments are due by midnight the day it is due, if submitted through Moodle.
> Exams will be in-class exams for on-campus students.
> EOL students need to have a proctor and should take the exam on the same day it is scheduled.
> If the class moves to online, exams will be proctored through Zoom. Students should have the capability to participate in the zoom session with video for proctoring remotely.
> Term Project: The term project will provide an opportunity for the students to implement an analysis method covered in class (usually contingency analysis) and assess its performance assessment on a given test system. Project will be a two-person team project and the team will prepare a written report and submit it with the supporting algorithm and assessment work. Matlab will be main software used for the project.

Grading Scale

> Total points earned from the course assignments (Class Total) will be used to determine the letter grade for the class.
> This course uses this grading scale, and may be adjusted based on Class Total Average.

Low	Letter	High
97 ≤	A+	≤ 100
93 ≤	A	< 97
90 ≤	A-	< 93
87 ≤	B+	< 90
83 ≤	B	< 87
80 ≤	B-	< 83
77 ≤	C+	< 80
73 ≤	C	< 77

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70 ≤	C-	< 73
67 ≤	D+	< 70
63 ≤	D	< 67
60 ≤	D-	< 63
0 ≤	F	< 60

COURSE POLICIES

Late Assignments

- Late assignments (HW and TP) will be accepted with 5 points taken off for every day submitted late. Assignments submitted later than 5 days passed the original due date will NOT be accepted.
- Only the University approved reasons will be accepted for missing a quiz (See http://www.ncsu.edu/policies/academic_affairs/pols_regs/REG205.00.4.php).
  In all cases, signed documentation must be provided to the Instructor so that the instructor can make a proper assessment if a make-up quiz is warranted. A make-up quiz will be administered at the mutual convenience of the student and the Instructor.

Incomplete Grades

Assigning an IN grade is at the discretion of the instructor. Students may be given an IN grade for work not completed because of a serious interruption in their work not caused by their own negligence. More details are at: https://policies.ncsu.edu/regulation/reg-02-50-03/

I advise that when you are having an unusually difficulty that will affect finishing an assignment/exam please contact me to discuss possible solutions This is also needed for discussing Incomplete grade option as well.

Student is expected to finish the missing work within the next academic calendar in order to convert the IN grade to a letter grade.

Attendance and Participation

Class attendance is not mandatory but highly encouraged. It is the responsibility of the student to keep up with the lectures and course assignments. Please have a look at NC State's Attendance Policy: https://policies.ncsu.edu/regulation/reg-02-20-03-attendance-regulations/ and the Withdrawl Process: https://studentservices.ncsu.edu/your-classes/withdrawal/process/

NETIQUETTE

Netiquette is the term used to describe the special set of rules for online communication.

Students should be aware that their behavior impacts other people, even online. I hope that we will all strive to develop a positive and supportive environment and will be courteous to fellow students and your instructor. Due to the nature of the online environment, there are some things to remember when taking an online course and engaging with others.

Tips for Success:
> **Do**: Follow the same standards of behavior that you subscribe to offline. Keep in mind that all online communication is documented and therefore permanent.
> **Don't**: Flame others in discussion forums. Flaming is the act of responding in a highly critical, sarcastic, or ridiculing manner – especially if done on a personal level. Remember that these discussions are meant for constructive exchanges and learning!
> **Do**: Encourage you to responding to discussions/questions on the forum and leave time for peers to comment on your response.
> **Don't**: Go for long periods of time without communicating to your instructors or classmates. It is important to stay a part of the online community!
> **Do**: Remember to read over your posts before selecting "Submit."
> **Don't**: Use slang, poor grammar, and other informal language in discussion forums or email messages to instructors or classmates.

Additional resources
> DELTA's Netiquette or Best Practices for Teaching Online
> Netiquette – Ethics in Computing

UNIVERSITY POLICIES

Academic Integrity and Honesty

Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct. Therefore, students are required to uphold the university pledge of honor and exercise honesty in completing any assignment.

Please refer to the Academic Integrity web page for a detailed explanation of the University's policies on academic integrity and some of the common understandings related to those policies.

Sharing Info
Students may be required to disclose personally identifiable information to other students in the course, via electronic tools like email or web-postings, where relevant to the course. Examples include online discussions of class topics and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course.

Students are responsible for reviewing the NC State University PRR's which pertains to their course rights and responsibilities:
>   Equal Opportunity and Non-Discrimination Policy Statement and additional references
>   Code of Student Conduct
>   Grades and Grade Point Average
>   Credit-Only Courses
>   Audits

Students with Disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Resource Office at Holmes Hall, Suite 304,Campus Box 7509, 919-515-7653 . For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation (REG02.20.01)

Trans-Inclusive Statement

In an effort to affirm and respect the identities of transgender students in the classroom and beyond, please contact me if you wish to be referred to using a name and/or pronouns other than what is listed in the student directory.

COURSE EVALUATIONS

ClassEval is the end-of-semester survey for students to evaluate instruction of all university classes. The current survey is administered online and includes 12 closed-ended questions and 3 open-ended questions. Deans, department heads, and instructors may add a limited number of their own questions to these 15 common-core questions.

Each semester students' responses are compiled into a ClassEval report for every instructor and class. Instructors use the evaluations to improve instruction and include them in their promotion and tenure dossiers, while department heads use them in annual reviews. The reports are included in instructors' personnel files and are considered confidential.

Online class evaluations will be available for students to complete during the last two weeks of the semester for full semester courses and the last week of shorter sessions. Students will receive an email directing them to a website to complete class evaluations. These become unavailable at 8am on the first day of finals.

> Contact ClassEval Help Desk: classeval@ncsu.edu
> ClassEval website
> More information about ClassEval

SYLLABUS MODIFICATION STATEMENT

Our syllabus represents a flexible agreement. It outlines the topics we will cover and the order we will cover them in. Dates for assignments represent the earliest possible time they would be due. The pace of the class depends on student mastery and interests. Thus minor changes in the syllabus can occur if we need to slow down or speed up the pace of instruction.

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Health and Well-Being Resources

These are difficult times, and academic and personal stress are natural results. Everyone is encouraged to take care of themselves and their peers. If you need additional support, there aremany resources on campus to help you:

- Counseling Center (NCSU Counseling Center)
- Student Health Services (Health Services | Student)
- If the personal behavior of a classmate concerns or worries you, either for the classmate's well-being or yours, we encourage you to report this behavior to the NC State CARES team: (Share a Concern).

If you or someone you know are experiencing food, housing or financial insecurity, please see the Pack Essentials Program (Pack Essentials).

Need Help?

If you find yourself in a place where you need help, academically or otherwise, please review these Step-by-Step Help Topics.

Other Important Resources

- **Keep Learning:** Keep Learning
- **Academic Success Center** (tutoring, drop in advising, career and wellness advising): Academic Success Center.
- **NC State Keep Learning, tips for students opting to take courses remotely:** Keep Learning Tips for Remote Learning
- **Introduction to Zoom for students:** https://youtu.be/5LbPzzPbYEw
- **Learning with Moodle, a student's guide to using Moodle:** https://moodle-projects.wolfware.ncsu.edu/course/view.php?id=226
- **NC State Libraries** Technology Lending Program

Course Continuity Plan

In the event of a campus disruption the plan is as follows:

1. I will send an initial email via Moodle Announcements Forum announcing the continuity plan and expectations in the event of a long-term campus disruption.
2. If continuity plan is enacted: I will continue sending a weekly email via Announcement Forum in Moodle highlighting upcoming tasks and schedule changes.

In the event the instructor is unable to manage the course for an extended period, the teaching assistant will continue to manage communications and the Moodle site and/or several weeks of materials will be available in Moodle so students can continue to make progress.

I will work with students on a case-by-case basis if the student has been impacted by a disruption as well.

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