

ECE 420 Energy Systems II Spring 2024

DESCRIPTION	Modeling and analysis of electric machines and three-phase AC power systems. Topics include but not limited to three-phase AC circuits, three-phase transformers, per unit, induction motors, and synchronous generators.
PREREQUISITES	Energy Systems I (UI ECE320 or equivalent) or instructor's permission.
INSTRUCTOR	Dr. Hangtian Lei
CLASS TIME	Tue, Thu, 2:00-3:15 pm, McClure Hall 117
CONTACT INFO	Phone: 208-885-0952 e-mail: hlei7@uidaho.edu
OFFICE HOURS	Appointment by Email
COURSE WEB SITE	https://webpages.uidaho.edu/ece/ee/power/ECE420/
TEXT	<i>Required: S. Chapman, Electric Machinery Fundamentals, 5th Edition, New York: McGraw-Hill, 2012, ISBN 978-0-07-352954-7.</i>
REFERENCES	1. J. D. Glover, T. J. Overbye, M. S. Sarma, A. B. Birchfield, <i>Power System Analysis and Design, 7th Edition</i> , Cengage Learning, 2022.
SOFTWARE	<ul style="list-style-type: none">You may be required to use MATLAB for homework assignments and project during this course. You can access the MATLAB software from on-campus computer labs or using the VLab resources. Instructions about VLab can be found here: https://support.uidaho.edu/TDClient/KB/ArticleDet?ID=226

GRADING:

Item	Percent of Grade	A: 90-100
Homework	30%	B: 80-89
Laboratory Work	10%	C: 70-79
Midterm Exam	30%	D: 60-69
Final Exam	30%	F: < 60

COURSE OUTLINE

Topic	Chapter/Book
1 Introduction to Power System Components	Notes
2. Three-Phase AC Circuit Analysis A. AC Circuit Components B. Phasor Representation C. Real Power, Reactive Power, Power Factor D. Balanced AC Circuit Analysis	Textbook: Pages 613-638
3. Three-Phase Transformers A. Ideal Transformer B. Real Transformer and Equivalent Circuit C. Open Circuit Test and Short Circuit Test D. Three-Phase Transformer Winding Connections E. Three-Phase Per Unit	Textbook: Chapter 2
4. AC Machinery Fundamentals	Textbook: Chapter 3
5. Induction Motors A. Introduction B. Rotating Magnetic Field C. Power and Torque Analysis D. Torque-Speed Characteristics E. Induction Motor Testing	Textbook: Chapter 6
6. Synchronous Generators A. Synchronous Generator Principles B. Rotor and Stator Equivalent Circuits C. Cylindrical Type Synchronous Generator Analysis D. Parallel Operation of Synchronous Generators E. Synchronous Generator Transients F. Synchronous Generator Capability Curve G. Salient-Pole Generators	Textbook: Chapter 4
7. Wrap up	

1. Note: homework assignments will require software tools, especially MATLAB.

LECTURE DATES:

Monday Date	Tuesday	Thursday
January 8		Lecture 1
15	Lecture 2	Lecture 3
22	4	5
29	6	7
February 5	8	9
12	10	11
19	12	13
26	14	15
March 4	16	17
11	H	H
18	18	19
25	20	21
April 1	22	23
8	24	25
15	26	27
22	28	29
29	30	31
May 6	Exam Week	

Final Exam: Scheduled time slot: TBD

GENERAL GUIDELINES:

On-Campus Students:

1. Assignments handed in after the due date will be worth a maximum of 50%. I may allow extensions if you have documented excuse.
2. Students are responsible for class attendance. If you miss 5 or more (including 5) lectures in this course without documented excuse, you will receive an F grade.
3. Returned homework and projects may not reach you prior to exams. Please make copies of any assignments that you believe may be useful before you submit them.

Please put your name and the course number on top of the first page of each exam and homework, especially if submitting by FAX or e-mail. It would be best if your name was in the header of each page. E-mail submission of assignments is ok, as long as compatible file formats are used. **I will let you know if I hire a teaching assistant.**

Allowable formats for electronic submission are Adobe Portable Document Format (PDF), Microsoft Word (*.doc or *.docx). Limit to one or two attached files. I don't want a large number of files with no documentation on what order to use them.

4. Make sure you number your pages as: 1/4, 2/4, etc., so I know whether or not I have a complete set. Also make sure writing is dark and clear on the FAX or a scan.
5. Library Resources: As a UI student, you not only have access to valuable print and electronic resources from the university's library, such as access to IEEE Xplore, but you also have the access to personalized assistance from the librarians. If you have assignments or research questions and aren't sure how to make the most of library resources from off campus, you can visit the Off-Campus Access information page on the library's website at

<http://www.lib.uidaho.edu/help/offcampus.html>

As a UI student you can also download a VPN client from the ITS Help Desk:

<http://www.uidaho.edu/its/Software>. You will need to log in using your UI student account.