

ECE 3600

Introduction to AC Power Engineering Fall 2020 Class Syllabus

Instructor: Arn Stolp
Office: MEB 2262
Phone: U of U: 581-4205
Home: Only if it's important: Cell: (801) 657-7766 or text, start text with "ECE 3600"
E-mail: arnstolp@ece.utah.edu Subject should start with "ECE 3600"
Office hours: My "office hours" are the Zoom sessions at class time. Otherwise, text me. Start text with "ECE 3600"

Web Site: <http://www.ece.utah.edu/~ece3600/>

Required and Recommended books and lab supplies:

Textbook: *Electrical Machinery and Power System Fundamentals*, by Stephen J. Chapman

Lab notebook (bound or spiral) and standard ECE lab supplies

Prerequisites: ECE 2210 or ECE 2240

Introduction:

Why do people care about electricity? Basically for two reasons-- information and energy. Computers, TVs, wireless devices, ipods and control systems all process, present, store and use information in the form of electrical signals. The circuits and theories behind these occupy the majority of your studies in Electrical Engineering. These circuits also require some energy to function (power supplies) and often need to control some energy to produce outputs (power amplifiers), both subjects for a power electronics class, not this class. Here we cover electrical energy in a more primal form-- the energy that lights your house, washes your clothes and moves you up the ski lift, all of which is done with AC power.

This class will introduce you to AC power use and generation, AC and DC machines, and AC power systems. We will study single-phase and 3-phase power, power factors and corrections, transformers, synchronous and induction machines, DC motors, power transmission lines, and introduce the concepts used to analyze power flow and faults.

I teach will concepts and the use of those concepts to solve problems, not formulas and memorization. The hands-down easiest way get a good grade in this class is to learn the concepts.

The Class:

I plan to teach most, if not all, of the class this semester as a "flipped" class.

Lectures: Watch video lectures before the Zoom session on the same subject

Lectures set the direction and tone of the class and cover more than the written material. You will be held accountable for everything discussed in the lectures, so watching on schedule is important. At this time lectures are at: ece.utah.edu/~ece3600/ECE3600lect_F20.html , they are also linked in Canvas.

Zoom Sessions: T & H 2:00 -3:20 pm

Attendance is a required part of this class. I may cover new material and examples not in the regular video lectures. These are also problem and review sessions and your primary chance to ask questions and get help, it's highly likely that you will never see me in person this semester. Together, the video lectures and the Zoom sessions make a "flipped" class.

Textbook:

Electrical Machinery and Power System Fundamentals, by Stephen J. Chapman.

Notes:

I've supplemented the textbook with lots of notes and examples which you will download from Canvas or the class web site (<http://www.ece.utah.edu/~ece3600/>). You will probably want to print much of this material. Most of the handouts are designed to be printed on both sides of the pages. Please conserve paper.

Homework, homework, and more homework:

100 pts.

I will assign a lot of homework, it will be your main study tool. As such, I'll give you all the numeric answers so that you can check your work immediately. In fact, you'll have to self-correct your homework. If you can't get the answer, check the web site for corrections, study some more, come to the problem session, ask for help, or see the posted solutions. Sometimes I even post solutions before the homework is due. So, you might ask, "Why is it handed in and 'graded'?" Well, to answer a question with a question, "Would you even do it otherwise?"

Your homework should be neat and clear and show all your work. For most problems the grader will simply check to see that you've done it and that your paper shows the necessary work to get the answer. Only a few problems will be checked in greater detail. You may collaborate with others to learn how to do the homework, but will need to hand in your own work. Copying or allowing another student to copy your work is considered cheating.

You will probably learn more from doing the homework than any other part of this class. If you thoroughly understand the homework, you will know what the class is about, and the exams should give you no trouble.

Please scan your homework to a pdf file and turn it in to Canvas by the due date.

Midterms:

300 pts.

You will take 3 one-hour midterms throughout the semester. I plan to use ProctorU, so make sure you are set up to use that. My exams are designed to see if you learned concepts and problem solving strategies and whether you can work with them, sometimes in new and different ways. Don't try to memorize formulas or specific

problems. Exams are normally closed book, closed notes, no phones, tablets or computers allowed, but will have to be a little different this semester.

Final: Wednesday, 12/9/20, 1:00 - 3:00pm 180 pts.
The final will be comprehensive with greater emphasis on the most recent material. It will also be in two parts. There will probably be a review Tuesday 12/8 at 4:00 pm. Watch class emails for details.

Labs: MEB 2365 No in-person labs at this time ?? pts.
Due to the severity of the coronavirus issues, there will be no in-person labs at this time. We may start some video labs, simulations or even in-person labs at any time, pay attention to your class emails.

Grades:	Pts	% of total	Grade
Homework:	100	> 93	A
Labs:	??		
Quizzes:	??	90-93	A-
Midterms:	300	87-90	B+
Final:	<u>180</u>	83-87	B
Total:	???	80-83	B-
		77-80	C+
Cheating:	-all	73-77	C
		70-73	C-
		67-70	D+
		63-67	D
		60-63	D-
		< 60	E

If you want any deviations from the normal requirements (say credit for work you've done before) you will need to see me before the work would normally be due and get an agreement *in writing*. You'll need to turn in your copy of the agreement with your final, so I'll remember to grade you properly.

COLLEGE OF ENGINEERING GUIDELINES

Fall Semester 2020

Americans with Disabilities Act (ADA)

The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you need accommodations in a class, reasonable prior notice needs to be given to the instructor and to the Center for Disability Services, 162 Olpin Union, 581-5020 (V/TDD) to make arrangements for accommodations. All written information in a course can be made available in alternative format with prior notification to the Center for Disability Services.

Adding Classes

Please read carefully: All classes must be added within two weeks of the beginning of the semester (deadline: Friday, September 4). Late adds will be allowed Sept 5 - Sept 14, requiring only the instructor's signature. Any request to add a class after September 14, will require signatures from the instructor, department, and Dean, and need to be accompanied by a petition letter to the Dean's office.

A \$50 FEE WILL BE ASSESSED BY THE REGISTRAR'S OFFICE FOR ADDING CLASSES AFTER September 14.

Withdrawal Procedures

See the web page for details: <http://registrar.utah.edu/academic-calendars/>

See the Class Schedule or web for more details. Please note the difference between the terms "drop" and "withdraw". Drop implies that the student will not be held financially responsible and a "W" will not be listed on the transcript. Withdraw means that a "W" will appear on the student's transcript and tuition will be charged.

Drop Period – No Penalty

Students may DROP any class without penalty or permission until Friday, September 4, 2020.

Withdrawal from Full Term Length Classes

Students may WITHDRAW from classes without professor's permission until Friday, October 16, 2020.

Between September 5 and October 16, a "W" will appear on the transcript AND tuition will be charged. Refer to Class Schedule, Tuition and Fees for tuition information.

Withdrawals after October 16 will only be granted due to compelling, nonacademic emergencies. A petition and supporting documentation must be submitted to the Dean's Office, 1602 Warnock Engineering Building. Petitions must be received before the last day of classes (December 3, 2020).

Withdrawal from Session I & Session II

See the web page for details: <http://registrar.utah.edu/academic-calendars/fall2020.php>

Repeating Courses

When a College of Engineering class is taken more than once, only the grade for the second attempt is counted. Grades of W, I, or V on the student's record count as having taken the class. Some departments enforce these guidelines for other courses as well (e.g., math, physics, biology, chemistry). Attempts of courses taken at transfer institutions count as one attempt. This means a student may take the course only one time at the University of Utah. Courses taken at the University of Utah may not be taken a second time at another institution. If a second attempt is needed, it must be at the University of Utah. Please work with your department advisor to determine the value of repeating courses. Students should note that anyone who takes a required class twice and does not have a satisfactory grade the second time may not be able to graduate. It is the responsibility of the student to work with the department of their major to determine how this policy applies in extenuating circumstances.

Appeals Procedures

See the Code of Student Rights and Responsibilities, located in the Class Schedule or on the UofU Web site for more details

Appeals of Grades and other Academic Actions

If a student believes that an academic action is arbitrary or capricious he/she should discuss the action with the involved faculty member and attempt to resolve. If unable to resolve, the student may appeal the action in accordance with the following procedure:

1. Appeal to Department Chair (in writing) within 40 business days; chair must notify student of a decision within 15 days. If faculty member or student disagrees with decision, then,
2. Appeal to Academic Appeals Committee (see <http://www.coe.utah.edu/current-undergrad/appeal.php> for members of committee). See II Section D, Code of Student Rights and Responsibilities for details on Academic Appeals Committee hearings.

ECE 3600

A. Stolp

Tentative

08/14/20

COURSE SCHEDULE

Week	Date	lect	Topics	Textbook
1	T 08/25	1	Introduction, Energy sources, generation, & environment	notes
	Th 08/27	2	Review of steady-state AC and phasors	1.1,2, notes
2	T 09/01	3	Review of RMS, Single-phase AC power	notes, 1.8
	Th 09/03	4	Single-phase AC power, P, Q, S, S , pf, pf correction	
3	M 09/07	Labor Day		
	T 09/08	5	3-phase power, Y- and delta-connections	2.1-2
	Th 09/10	6	3-phase power, balanced systems, efficiency, One-line diagrams	2.4-6
4	T 09/15	7	One-line diagrams, Electromagnetics, Ideal transformers, Ratings	2.6, 1.4
	Th 09/17	8	Transformation of impedance, Model of the non-ideal transformer	1.4
5	T 09/22	9	Transformer voltage regulation, Autotransformers, 3-phase, etc.	3.1-4
	Th 09/24	Exam 1		
6	T 09/29	10	Per-unit system	3.5-8
	Th 10/01	11	Per-unit system	3.9-12
7	T 10/06	12	Rotational Motion, AC Machinery Fundamentals, Synchronous machines	1.3, Ch 4
	Th 10/08	13	Synchronous machines as generators	5.1-4
8	T 10/13	14	Synchronous machines as motors, pf correction	5.4-8
	Th 10/15	15	Synchronous generator on line, 3-phase Induction motors	5.9-13, Ch 6
9	T 10/20	Exam 2		
	Th 10/22	16	3-phase Induction motors	Ch 7
10	T 10/27	17	Single-phase Induction motors, DC motors	notes
	Th 10/29	18	DC motors	Ch 8
11	T 11/03	19	DC motors	Ch 8
	Th 11/05	20	Transmission lines and models	Ch 9
12	T 11/10	21	Transmission line models and calculations	Ch 9
	Th 11/12	Exam 3		
13	T 11/17	22	Power System	Ch 10
	Th 11/19	23	Power Flow	Ch 10, 11
14	T 11/24	24	Power Flow	Ch 11
	Th 11/26	Thanksgiving		
15	T 12/01	25	Symmetrical faults	Ch 12
	Th 12/03	26	Faults, The 3 "sequences", Unsymmetrical faults	Ch 12, 13
16	T 12/08	Review, 4:00		
	W 12/09	Final Exam, 1:00 - 3:00 PM		

ECE 3600 Fall Semester, 2020

A. Stolp 8/18/20

Month	Week	Mon	Tue	Wed	Thur	Fri
Aug	1	24	25 First Class	26	27	28
	2	31	1	2	3	4 Last day to add or drop
Sept	3	7 Labor Day	8	9	10	11
	4	14	15	16	17	18
	5	21	22	23	24 Exam 1	25
	6	28	29	30	1	2
Oct	7	5	6	7	8	9
	8	12	13	14	15	16
	9	19	20 Exam 2	21	22	23
Nov	10	26	27	28	29	30
	11	2	3	4	5	6
	12	9	10	11	12 Exam 3	13
	13	16	17	18	19	20
	14	23	24	25	26 Thanksgiving	27
Dec	15	30	1 ME Design Day in Union bldg (maybe)	2	3 Last Day of Classes	4 Reading Day
	16	7 Finals	8 ECE 3600 Review 4:00	9 ECE 3600 1:00	10	11

