

# Course Syllabus

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EEL 4271/6275 Power System Protection

1. Catalog Description – (3 credits) Power systems protection analytical methodologies and algorithms. Analyzes different methods for equipment and systems protection and discusses wide-area monitoring techniques, which allow real-time operation and control. Introduces cyber-physical security approaches for the smart grid and realizes numerical construction of protection methods considering realistic engineering hypothesis
2. Pre-requisites – EEL 4251 or instructor permission
3. Course Objectives – The student will be able to develop appropriate models for all power system relays. Students will be able to demonstrate power systems protection setting and coordination for generation, transmission and distribution equipment
4. Contribution of course to meeting the professional component (ABET only – undergraduate courses) – 1.5 credits of Engineering Science and 1.5 credits of Engineering Design
5. Relationship of course to program outcomes (ABET only – undergraduate courses) – a, c
6. Instructor – Dr. Arturo Bretas
  1. Office location: 427 NEB
  2. Telephone: 352-392-4949
  3. E-mail address: arturo@ece.ufl.edu
  4. Class Web site: UF's E-learning (Canvas)
  5. Office hours: Tuesdays and Thursdays (10:00 am - Noon) - Zoom
7. Teaching Assistant

1. Tierui (Terry) Zou (tieruizou@ufl.edu) ; Office Hours: Monday and Wednesday (noon -1:00 pm) ; Meeting ID: 949 2556 1902.
2. Nader Aljohani
  1. E-mail: [eng89nader@ufl.edu](mailto:eng89nader@ufl.edu)
  2. Office hours: Monday and Wednesday (11:00 am- noon) @ Zoom
  3. Meeting ID: 943 4590 6863
  
8. Meeting Times and Location – Tuesday, 7<sup>th</sup> period (1:55-2:45 pm) and Thursday, 7<sup>th</sup>-8<sup>th</sup> period (1:55 – 3:50 pm) - Zoom
  
9. Class/laboratory schedule – 3 class periods each week consisting of 50 minutes each
  
10. Material and Supply Fees – None
  
11. Textbooks and software recommended –
  - o Title: Power System Relaying
  - o Author: Stanley Horowitz, A G. Phadke
  - o Publication date, edition, and company: 4<sup>th</sup> edition (2014), Wiley
  - o ISBN number: 978-1-118-66200-7
  
12. Recommended additional reading –
 

Paul M. Anderson, Power Systems Protection, 1<sup>st</sup> edition, Wiley, 1998, ISBN number: 978-0780334274

13. Course Outline –

<b>Week</b>	<b>Topic</b>	<b>Chapter</b>
1	Introduction to Protective Relaying	1
2	Relaying Operating Principles	2
3/4	Non-pilot Overcurrent Protection	4
5/6	Non-pilot Distance Protection	5
7/8	Pilot Protection	6

	Midterm 02/25/2021 @ 1:55 – 3:50 pm	
9	Rotating Machinery Protection	7
10	Bus, Reactor, and Capacitor Protection	9
11	Power System Phenomena and Relaying	10
12	Relaying for System Performance	11
13	Switching Schemes and Procedures	12
14	Monitoring Performance and Power Systems	13
14	Improved Protection with WAMS	14
15	Fault Location	15
16	Final Exam 4/29/2021 @ 03:00 - 05:00 pm	

14. Attendance and Expectations – Cell phones and other electronic devices are to be silenced. No text messaging during class or exams.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx> (Links to an external site.)

15. Grading –

Exams 80%

Homework 20%. Some simple programming skill may be required.

Note:

This course is co-listed with the graduate class. The homework portion of the graduate section will involve additional work and more advanced concepts with respect to the undergraduate section. The exams will also involve more advanced concepts with respect to the undergraduate section.

Grading Scale –

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
93-100	90-92	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	60-62	0-59

A C- will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: a C-average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx> (Links to an external site.)

16. Make-Up Exam Policy - If you have a University-approved excuse and arrange for it in advance, or in case of documented emergency, a make-up exam will be allowed and arrangements can be made for making up missed work. University attendance policies can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx> (Links to an external site.)

Otherwise, make-up exams will be considered only in extraordinary cases, and must be taken before the scheduled exam. The student must submit a written petition to the instructor two weeks prior to the scheduled exam and the instructor must approve the petition.

17. Honesty Policy – UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

18. Accommodation for Students with Disabilities – Students requesting classroom accommodation must first register with the Dean of Students Office. That office will

provide documentation to the student who must then provide this documentation to the course instructor when requesting accommodation.

19. UF Counseling Services – Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

- UF Counseling & Wellness Center, psychological and psychiatric services, 3190 Radio Rd, 392-1575, online: <http://www.counseling.ufl.edu/cwc/Default.aspx> ([Links to an external site.](#)),
- Career Resource Center, Reitz Union, career and job search services, 392-1601.
- University Police Department, 392-1111 or 911 for emergencies

20. Software Use – All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

21. Course Evaluation – Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at Canvas through GatorEvals. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at: <https://gatorevals.ua.ufl.edu/public-results/> ([Links to an external site.](#)) .

## Course Summary:

Date	Details
Tue Jan 12, 2021	Calendar Event <a href="#">Office Hours Tuesday</a> 10am to 11am
	Calendar Event <a href="#">Tuesday Class Meeting</a> 1:55pm to 2:55pm
Thu Jan 14, 2021	Calendar Event <a href="#">Office Hours - Thursday</a> 10am to 11am
	Calendar Event <a href="#">Thursday Class Meeting</a> 1:55pm to 3:55pm
Tue Jan 19, 2021	Calendar Event <a href="#">Office Hours Tuesday</a> 10am to 11am
	Calendar Event <a href="#">Tuesday Class Meeting</a> 1:55pm to 2:55pm
Thu Jan 21, 2021	Calendar Event <a href="#">Office Hours - Thursday</a> 10am to 11am
	Calendar Event <a href="#">Thursday Class Meeting</a> 1:55pm to 3:55pm
Tue Jan 26, 2021	Calendar Event <a href="#">Office Hours Tuesday</a> 10am to 11am

Date	Details
Thu Jan 28, 2021	Calendar Event <a href="#">Tuesday Class Meeting</a> 1:55pm to 2:55pm Calendar Event <a href="#">Office Hours - Thursday</a> 10am to 11am
Tue Feb 2, 2021	Calendar Event <a href="#">Thursday Class Meeting</a> 1:55pm to 3:55pm Calendar Event <a href="#">Office Hours Tuesday</a> 10am to 11am
Thu Feb 4, 2021	Calendar Event <a href="#">Tuesday Class Meeting</a> 1:55pm to 2:55pm Calendar Event <a href="#">Office Hours - Thursday</a> 10am to 11am
Tue Feb 9, 2021	Calendar Event <a href="#">Thursday Class Meeting</a> 1:55pm to 3:55pm Calendar Event <a href="#">Office Hours Tuesday</a> 10am to 11am
Thu Feb 11, 2021	Calendar Event <a href="#">Tuesday Class Meeting</a> 1:55pm to 2:55pm Calendar Event <a href="#">Office Hours - Thursday</a> 10am to 11am
Tue Feb 16, 2021	Calendar Event <a href="#">Thursday Class Meeting</a> 1:55pm to 3:55pm Calendar Event <a href="#">Office Hours Tuesday</a> 10am to 11am
Thu Feb 18, 2021	Calendar Event <a href="#">Tuesday Class Meeting</a> 1:55pm to 2:55pm Calendar Event <a href="#">Office Hours - Thursday</a> 10am to 11am
Tue Feb 23, 2021	Calendar Event <a href="#">Thursday Class Meeting</a> 1:55pm to 3:55pm Calendar Event <a href="#">Office Hours Tuesday</a> 10am to 11am
Thu Feb 25, 2021	Calendar Event <a href="#">Tuesday Class Meeting</a> 1:55pm to 2:55pm Calendar Event <a href="#">Office Hours - Thursday</a> 10am to 11am
Tue Mar 2, 2021	Calendar Event <a href="#">Thursday Class Meeting</a> 1:55pm to 3:55pm Calendar Event <a href="#">Office Hours Tuesday</a> 10am to 11am
Thu Mar 4, 2021	Calendar Event <a href="#">Tuesday Class Meeting</a> 1:55pm to 2:55pm Calendar Event <a href="#">Office Hours - Thursday</a> 10am to 11am
Tue Mar 9, 2021	Calendar Event <a href="#">Thursday Class Meeting</a> 1:55pm to 3:55pm Calendar Event <a href="#">Office Hours Tuesday</a> 10am to 11am
Thu Mar 11, 2021	Calendar Event <a href="#">Tuesday Class Meeting</a> 1:55pm to 2:55pm Calendar Event <a href="#">Office Hours - Thursday</a> 10am to 11am
Tue Mar 16, 2021	Calendar Event <a href="#">Thursday Class Meeting</a> 1:55pm to 3:55pm Calendar Event <a href="#">Office Hours Tuesday</a> 10am to 11am
Thu Mar 18, 2021	Calendar Event <a href="#">Tuesday Class Meeting</a> 1:55pm to 2:55pm Calendar Event <a href="#">Office Hours - Thursday</a> 10am to 11am
Tue Mar 23, 2021	Calendar Event <a href="#">Thursday Class Meeting</a> 1:55pm to 3:55pm Calendar Event <a href="#">Office Hours Tuesday</a> 10am to 11am
Thu Mar 25, 2021	Calendar Event <a href="#">Tuesday Class Meeting</a> 1:55pm to 2:55pm Calendar Event <a href="#">Office Hours - Thursday</a> 10am to 11am
Tue Mar 30, 2021	Calendar Event <a href="#">Thursday Class Meeting</a> 1:55pm to 3:55pm Calendar Event <a href="#">Office Hours Tuesday</a> 10am to 11am
	Calendar Event <a href="#">Tuesday Class Meeting</a> 1:55pm to 2:55pm

Date	Details
Thu Apr 1, 2021	Calendar Event <a href="#">Office Hours - Thursday</a> 10am to 11am
	Calendar Event <a href="#">Thursday Class Meeting</a> 1:55pm to 3:55pm
Tue Apr 6, 2021	Calendar Event <a href="#">Office Hours Tuesday</a> 10am to 11am
	Calendar Event <a href="#">Tuesday Class Meeting</a> 1:55pm to 2:55pm
Thu Apr 8, 2021	Calendar Event <a href="#">Office Hours - Thursday</a> 10am to 11am
	Calendar Event <a href="#">Thursday Class Meeting</a> 1:55pm to 3:55pm
Tue Apr 13, 2021	Calendar Event <a href="#">Office Hours Tuesday</a> 10am to 11am
	Calendar Event <a href="#">Tuesday Class Meeting</a> 1:55pm to 2:55pm
Thu Apr 15, 2021	Calendar Event <a href="#">Office Hours - Thursday</a> 10am to 11am
	Calendar Event <a href="#">Thursday Class Meeting</a> 1:55pm to 3:55pm
Tue Apr 20, 2021	Calendar Event <a href="#">Office Hours Tuesday</a> 10am to 11am
	Calendar Event <a href="#">Tuesday Class Meeting</a> 1:55pm to 2:55pm