Department of Electrical and Computer Engineering

**EEL 4215 – POWER SYSTEMS III**
**Fall 2022**

Instructor : Dr. Arif Sarwat
Office Hours : Tuesday & Thursday 12:15 – 1:30 pm

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Class : EC 2830

Prerequisite : EEL-4214

**Specific Course Information:**
The purpose of this course is to provide the basic knowledge of fault analysis, protection, voltage and frequency regulations, and stability in power systems. Introduce students to modern tools and technique to address various reliability challenges of electric power systems.

**Reference Textbook:**
1. Power System Analysis and Design 6th Edition, Glover, Sarma & Overbye, Cengage Learning (ISBN: 978-1-305-63213-4)
2. Power System Analysis, A.R.Bergen, V. Vittal, Second Edition
3. Power Systems, B. R. Gungor

**Course Objectives:**
1. To develop methods of analyzing the power system under fault conditions, covering symmetrical components and fault analysis techniques.
2. To develop understanding various types of faults.
3. To develop understanding transient stability issues and their solution techniques
4. To identify relay input sources for power system protection and cover various relay operation
5. To develop ways for components and system protection strategies
6. To get familiarize the concepts of power system control

**ABET Relationship of course to program outcomes:**

☒a) an ability to apply knowledge of mathematics, science, and engineering
☒c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d) an ability to function on multi-disciplinary teams
☒e) an ability to identify, formulate, and solve engineering problems
f) an understanding of professional and ethical responsibility
g) an ability to communicate effectively
☒h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) a recognition of the need for, and an ability to engage in life-long learning
j) a knowledge of contemporary issues
☒k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering
practice
l) an ability to apply probability and statistics, including applications to electrical engineering program

**Grading Scale:**

| **Grade and range** | |
|---|---|
| A | 95-100 |
| A- | 90-94 |
| B+ | 85-90 |
| B | 82-85 |
| B- | 80-82 |
| C+ | 75-80 |
| C | 72-75 |
| C- | 70-72 |
| D | 60-70 |
| F | < 60 |

**Percentage Distribution:**

| Topic | Percentage |
|---|---|
| Class Assignments | 10% |
| Test 1 | 20% |
| Project/Case studies | 40% |
| Test 2 | 30% |
| **Total** | **100%** |

**Department Regulations Concerning Incomplete Grades**

*To qualify for an Incomplete, a student:*

1. Must contact (e.g., phone, email, etc.) the instructor or secretary before or during missed portion of class
2. Must be passing the course prior to that part of the course that is not completed
3. Must make up the incomplete work through the instructor of the course
4. Must see the instructor. All missed work must be finished before last two weeks of the following term.

**Class Schedule:**

| Week | Tuesday/Thursday topics | Homework: Due |
|---|---|---|
| 01 | Power system models and components, Basics of Fault analysis | |
| 02 | Power System faults and reliability challenges, symmetrical Components | |
| 03 | Three-Phase (symmetrical) fault analysis, R-L circuit transients, Bus impedance matrix | |
| 04 | Power system three phase short circuits | HW01 |
| 05 | Circuits breakers and fuse selection | |
| 06 | Sequence networks of loads, lines and machines | |
| 07 | Unsymmetrical faults analysis, line-line, line to ground, double line- ground, sequence bus impedance matrix | |
| 08 | Two-lines-open utilizing symmetrical components technique | HW02 |
| 09 | Project/ Case study | Test-1 |
| 10 | Relay and protection in power systems | |
| 11 | Software applications and its use | |
| 12 | Power system controls: voltage and frequency regulation systems are required for power system dynamic stability | |
| 13 | Transient Stability | HW03 |
| 14 | Power electronic applications in power systems, converters, components and integration | HW04 |
| 15 | Smart Grid, PMU's and reliability challenges | |
| 16 | Project Presentation | Test-2 |

**Policies:**

1. **Academic Misconduct:** For work submitted, it is expected that each student will submit their own original work. Any evidence of duplication, cheating or plagiarism will result at least a failing grade for the course.
2. Absences: Resolution of absences and materials missed are student responsibility
   a) **Unexcused Absences:** Two unexcused absences are permitted during the term. More than two will result in the loss of points from your final grade. (1 point per absence above two, 3 points per absence above 5).
   b) **Excused Absences:** Only emergency medical situations or extenuating circumstances are excused with proper documentation.
      - 1. Review documentation with the lecturer,
      - 2. email as a written record to watsonh_fiu@yahoo. (Note underscore)
        - Name, SID, class, section, description, and date of the absence
3. **On Time:** As in the workplace, on time arrival, preparation, and submissions are required.
4. **Deadlines: Work is due on the date specified.** Late submissions within one week will receive up to half credit. After one-week, **late work will not be accepted**. Late submissions are graded after the final exam.
   **Participation deadlines are absolute – no late completions are accepted.**
5. **Submissions:** This class is paperless. Submissions are made using the web form listed on the class web site (both online and in class sections). All submissions must be a) a single document, b) web accessible by anyone and readable with a browser c) accessible using a single URL reference
6. **DO NOT** submit work by email.
7. Instructor reserves right to change course materials or dates as necessary.

**University's Code of Academic Integrity:**
http://academic.fiu.edu/academic_misconduct.html

"Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas, and community service. All students should respect the right of others to have an equitable opportunity to learn and honestly to demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook."

**University policies:** on sexual harassment, and religious holidays, and information on services for students with disabilities
http://academic.fiu.edu/
http://drc.fiu.edu