EE 4510 Course Syllabus
Power Systems

Description: This class introduces 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.

Prerequisite: EE 2260.

Prerequisite / Co-requisite: EE 3310

Credits: 4 credit hours, 6 contact hours per week.

Text: Chapman, Electrical Machinery and Power System Fundamentals.

Student Learning Outcomes: Students will be able to

1. Apply the basic principles of circuit analysis to AC networks.
2. Apply phasor representation to solve AC networks.
3. Solve the network and evaluate performance of single-phase and three-phase networks.
4. Determine the equivalent circuit of single- and three-phase transformers.
5. Apply the principles of electric machines and their control.
6. Apply AC circuit analysis techniques to transmission lines and interconnected power networks.

Student Assessment:

1. Homework 20%
2. Lab Assignments 20%
3. Midterm Exam 1 15%
4. Midterm Exam 2 15%
5. Final Exam 30%

Topic Outline

1. Power Generation
2. 3-Phase, Y and Δ.
3. Efficiency
4. Transformers
5. AC Machines
6. Synchronous Machines
7. Induction Motors
8. DC Motors
9. Transmission Lines
10. Faults

Letter grades are assigned according to the scale below. Borderline cases may be promoted (again, at the instructor’s discretion).
 A 93% or more
 A- 90% - 92.99%
 B+ 87% - 89.99%
 B 83% - 86.99%
 B- 80% - 82.99%
 C+ 77% - 79.99%
 C 73% - 76.99%
 C- 70% - 72.99%
 D 60% - 69.99%
 E below 60%

**Services for Students with Disabilities:** Any student requiring accommodations or services due to a disability must contact Services for Students with Disabilities (SSD) in Room 181 of the Student Services Center. SSD can also arrange to provide course materials (including the syllabus) in alternative formats if necessary.

Tentative Course Schedule

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| --- | --- | --- | --- |
| Lecture | Date | Topics | Textbook |
| 1 | 1/7 | Introduction, Energy Sources and Generation | 1.1, 1.2 |
| 2 | 1/9 | Rotational Motion, Newton’s Law, Power Relationships | 1.3 |
| 3 | 1/14 | 3-Phase Power, Y-and -Connections | 2.1, 2.2 |
| 4 | 1/16 | Balanced System, Efficiency | 2.4-2.6 |
| 5 | 1/21 | Magnetic Field, Faraday’s Law | 1.4, 1.5 |
| 6 | 1/23 | Induced Force, Induced Voltage, Complex Power | 1.6, 1.7, 1.8 |
| 7 | 1/28 | Model of Non-Ideal Transformer | 3.1, 3.2, 3.3 |
| 8 | 1/30 | Review for Mid Term #1 |  |
| 9 | 2/4 | Mid Term #1 |  |
| 10 | 2/6 | Per-Unit System, Transformer Voltage Regulation | 3.5-3.8 |
| 11 | 2/11 | Autotransformers, 3-Pahase Transformers | 3.9-3.12 |
| 12 | 2/13 | Rotating Magnetic Field, AC Machines | 4.1-4.3 |
| 13 | 2/18 | Induced Torque in an AC Machine, Power Flows and Losses | 4,4-4.7 |
| 14 | 2/20 | Synchronous Machines | 5.1-5.4 |
| 15 | 2/25 | Synchronous Machines as Generators | 5.4-5.8 |
| 16 | 2/27 | Synchronous Machines as Motors | 5.9-5.13 |
| 17 | 3/4 | Review for Mid Term #2 |  |
| 18 | 3/6 | Mid Term #2 |  |
|  | 3/11 | Spring Break |  |
|  | 3/13 | Spring Break |  |
| 21 | 3/18 | Synchronous Generator on Line | Ch 6 |
| 22 | 3/20 | 3-Phase Induction Motors | Ch 7 |
| 23 | 3/25 | DC Motors | Ch 8 |
| 24 | 3/27 | Transmission Lines and Models | Ch 9 |
| 25 | 4/1 | Transmission Lines and Calculations | Ch 9 |
| 26 | 4/3 | Symmetrical Faults | Ch 12 |
| 27 | 4/8 | Unsymmetrical Faults | Ch 13 |
| 28 | 4/10 | Field Trip (Gadsby Power Plant) |  |
| 29 | 4/15 | Field Trip (Rocky Mountain Power) |  |
| 30 | 4/17 | Review for Final Exam |  |
|  |  | Final Exam |  |