EEE 463 Electrical Power Plants (3) [F]

Course (Catalog) Description:

Prerequisites:
CHM 114 (or 116); MAE 240 (or PHY 241); MAT 274 (or 275)

Textbook:

Supplemental Materials:

Coordinator:
K.E. Holbert, Associate Professor

Prerequisites by Topic:
1. Thermodynamics as applied to steam cycles
2. Circuit analysis

Course Objective:
Provide students with a broad understanding of electricity generation

Course Outcomes:
1. Students will have a basic understanding of conversion of coal, oil, gas, nuclear, hydro, solar, geothermal, etc. energy to electrical energy
2. Students will understand the operation and major components of fossil and nuclear power plants

Course Topics:
1. Principal fuels for energy conversion (oil, gas, coal, nuclear, solar) (4 lectures)
2. Energy sources and utilization, Electricity economics (4 lectures)
3. Conversion of chemical and nuclear energy (4 lectures)
4. Thermodynamic cycle analysis (5 lectures)
5. Components and operation of fossil-fired power plant (2 lectures)
6. Components and operation of a nuclear power plant (2 lectures)
7. Hydroelectric power (1 lecture)
8. Environmental impact of electric generation (3 lectures)
9. Advanced energy conversion systems (geothermal, biomass,..) (4 lectures)
10. Solar energy (4 lectures)
11. Combined cycle plants (2 lectures)
**Computer Usage:**
Computer use is integrated within the homework assignments. Students are allowed to use the computer tools of their choice including Excel, Matlab, Matchcad, etc. Typically, the types of homework assignments requiring computer use include solving transcendental equations, and performing numerical integration. In addition, students must use the computer tools to plot results from the analysis of reference data and from the solution of numerical problems.

**Laboratory Experiments:** None.

**Course Contribution to Engineering Science and Design:**
This course teaches engineering science through the application of scientific principles to engineering problems. For example, students use their chemistry knowledge to determine combustion products, reactant (fuel) mass flows, and energy production. This course also affords the student the opportunity to solve open-ended problems involving the selection of a suitable engineering option based upon constraints. For example, students compare and contrast various electric generation schemes for future construction based on political, environmental, regulatory and engineering constraints.

**Course Relationship to Program Outcomes:**
This course contributes to achieving the following program objectives:

- **a:** Students must apply both mathematics and chemistry to understand and solve problems in this course.
- **c** and **e:** Students perform design type analyses and solve engineering problems.
- **j:** There are many aspects of contemporary issues addressed in this course, especially with regard to power plant environmental and siting issues.
- **k:** Students utilize modern tools such as the computer to solve problems.

Person preparing this description and date of preparation: Keith Holbert, September 2008.