

ME 4610 Steam Power Plants

2007 Catalog Data: ME 4610. Steam Power Plants. Lec. 3. Credit 3.
Prerequisites: ME 3220, ME 3710, ME 3720. Fuels, coal properties, firing methods, boilers and other heat exchangers, turbine characteristics, cooling water and cooling towers, dust collection, new developments, plant trip. [Elective Course]

Prerequisites by Topic:

1. Thermodynamics of the reheat regenerative Rankine cycle
2. Thermodynamics of cooling towers
3. Conduction, convection and radiation heat transfer
4. Principles of combustion
5. Fluid flow through tubes and over flat surfaces

Textbook and Resources: Steam, Its Generation and Use, Babcock & Wilcox
Research reports, Electric Power Research Institute

Course Objectives: Introduce the basic concepts concerning the generation of electric power at a coal burning plant. Characteristics of boilers, turbines and other plant components are introduced. Fuel characteristics and combustion fundamentals are discussed.

Course Topics:

T1. Thermodynamics of the Rankine cycle	(11%)
T2. Overview of steam power plants	(21%)
T3. Boilers and their operation	(7%)
T4. Turbines and their operation	(5%)
T5. Balance of plant equipment	(9%)
T6. Coal as a fuel	(5%)
T7. Combustion fundamentals	(14%)
T8. Boiler efficiency testing	(21%)
T9. Remaining life analysis of plant components	(7%)

Class Schedule: Minimum student contact time – 2200 minutes

Course Outcomes: Upon completion of this class, the student will be able to:

- C1. Conduct thermodynamic analysis of reheat, regenerative Rankine Cycle. [a,e,k,l]
- C2. Recognize the general functioning of a coal fired power plant. [e,h,j,k,l]
- C3. Investigate fundamental concepts of operating boilers and steam turbines. [e,k,l]
- C4. Recognize other main power plant equipment. [e,k,l]
- C5. Investigate different coal properties related to combustion performance. [e,k,l]
- C6. Work basic combustion problems related to fossil fuels. [e,k,l]
- C7. Calculate a utility boiler's efficiency based on PTC 4.1. [a,c,e,k,l]
- C8. Investigate remaining life estimation techniques for plant components. [a,c,e,k,l]

And have gained experience with and/or exposure to:

C9. The preparation and delivery of a technical oral presentation. [h]

Professional Component: This is an elective course for Mechanical Engineering students who follow an Area of Concentration (AOC) related to "thermal/energy systems." It involves the integration of foundational course material in the practical setting of a coal-fired power plant.

Contribution of Course to Meeting the Professional Component:

Math and Basic Science:

General Education:

Engineering: 3 credit hours

Other:

Relation to Program Objectives: This course goes beyond the presentation of basic "analytical" skills, to incorporate experience in critical thinking (integration of analytical skills, quantitative and qualitative evaluation of alternatives) and communication (oral presentations). As a consequence, students who successfully complete this class should be more comfortable, confident and productive when engaged in career activities that involve: self-education and interaction with engineering and non-engineering communities and individuals.

Course Coordinator: Undergraduate Program Committee

Prepared by: Glenn T. Cunningham

Date: 1-15-08