

CENG4140 Energy Resources and Conversion Technologies

Assessment

- (1) 10 tutorials and assignment – (10 x 7%)
- (2) Projects (20%)
- (3) Individual presentation (10%)

Textbooks

- (1) Kenneth C. Weston “Energy Conversion”

Available on the course web or <http://www.personal.utulsa.edu/~kenneth-weston/>

- (2) Smith, R., “Chemical Process Design and Integration”

Wiley, ISBN 0-471-48681-7.

Soft copy is e-book available in HKUST library

Topics covered

Course outline:	Lecture/Tutorial/Exercises	Reports
Week 1	Lecture: Course Introduction Introduction to design projects: 1. Town Gas Production 2. CLP combined Cycle Tutorial: Getting Start with Aspen+ (using Virtual Barn) Exercises 1: Using Aspen+ for "Air Heating and Compression" Reading for this week: Aspen Plus - Getting Started Building and Running a Process Model Aspen Plus Training Manual	EX1: Heating and compression of air
Week 2	Lecture: Heat Integration (Pinch Analysis) Tutorial: SPRINT (Energy Targeting and Heat Exchanger Network Design) Exercises 2: Using Aspen+ for "Energy Targeting and Design of a Crude Oil Preheat Chain" Reading for this week: Process Design and Integration - Chapter 17, 18 and 19.	EX2: HEN targeting and design
Week 3	Lecture: Heat Integration (Data Extraction & Utility Selection) Tutorial: Data Extraction from Aspen+ to SPRINT Exercises 3: Stream data extraction and heat integration of a combined cycle power plant Reading for this week: Energy Conversion - Chapter 3: Fuels and Combustion (Section 3.1 & 3.2) Formulas and Graphs for Representing the Interchangeability of Fuel Gases (Weaver).pdf	EX3: Data Extraction and Energy Targeting of a combined cycle power plant
Week 5	Lecture: Combustion of Gas Fuels (Interchangeability of Fuel Gases) Exercises 4: Combustion of Natural Gas (Excel) Characteristics of Town Gas Optimization of Town Gas Production (simplified flow sheet) Reading for this week: Energy Conversion: Chapter3 - Fuels and Combustion (Section 3.3: combustion of coal)	EX4: Characteristics of Town Gas

Week 6	<p>Lecture : Analysis and Combustion of coal</p> <p>Exercises 5: Estimating heat value of solid fuel (Excel)</p> <p>Combustion of coal, Air to Fuel Ratio and Excess Air(Excel)</p> <p>Estimation of Combustion Temperature(Excel)</p> <p>Reading for this week:</p> <p>Energy Conversion: Chapter2 - Fundamental of Steam Power</p> <p>Sustainable Energy Conversion for Electricity and Coproducts: Chapter 8</p> <p>Process Design and Integration: Chapter 23 - Steam system and cogeneration</p>	EX5: Coal Combustion and coal fired steam boiler
Week 7	<p>Lecture: Flue Gas Monitoring and Acid Dew Point Prediction</p> <p>Exercises 6: Flue Gas analysis</p> <p>Estimation of acid dew point</p> <p>Simulation of a Coal Fired Power Plant</p> <p>Reading for this week:</p> <p>Energy Conversion: Chapter 5 - Gas Turbine and Jet Engine</p> <p>Sustainable Energy Conversion for Electricity and Coproducts: Chapter 6.1</p> <p>GE Gas Turbine Performance Characteristics (Frank J. Brooks)</p>	EX6: Coal Fired Power plant simulation
Week 8	<p>Lecture: Steam power plant (Rankine Cycle)</p> <p>Exercises 7: Simulation of a coal fired steam boiler</p> <p>Composite Curves of a steam boiler</p> <p>Simulation of a Steam Power Plant</p> <p>Pinch analysis of steam power plant</p> <p>Reading for this week:</p> <p>Aspen+ Manual - Getting Start with Solid</p>	EX7: Gas Turbine simulation and optimization
Week 9	<p>Lecture: Gas Turbine cycle</p> <p>Exercises 8: Simulation and Optimization of Gas Turbine (Excel)(Aspen)</p> <p>Reading for this week:</p> <p>Sustainable Energy Conversion for Electricity and Coproducts: Chapter 9 (combined cycle power plant)</p>	EX8: Gas turbine design and simulation
Week 10	<p>Lecture: Combined Cycle Power Plant / Integrated Coal Gasification Combined Cycle Power Plant (IGCC)</p> <p>Exercises 9: Simulate of a Gas Fired Combined Cycle Power Plant (Aspen+)</p>	EX9: Coal Gasification and combined cycle power plant
Week 11	<p>Lecture: Oil refinery / properties of crude oil and liquid fuels</p> <p>Exercises 10: Refinery Planning</p> <p>Gasoline Blending</p>	EX10: Refinery Planning, Gasoline Blending
Week 12	<p>Short Presentations (5-10 minutes per person)</p> <p>Design Projects: Working on Project 1 and 2</p>	Project 1 & 2 reports