CHE 4183 Petroleum Refinery Design

Option for Required Elective for ChE program

Catalog Description: The application of chemical engineering principles to the design of petroleum refinery equipment, including crude fractionators, heat exchangers, and fired heaters. Computer simulation is emphasized.

Prerequisite: Permission of instructor.

Recent Textbook: J.H. Gary, G.E. Handwerk, and M. J. Kaiser (2007) "Petroleum Refining: Technology and Economics", 5 th ed. CRC Press; and class handouts.

Recent References: "API Technical Data Book – Petroleum Refining", 1988; R.E. Thompson, "Introduction to Refinery Analysis Using Computers", O&GCI, 1997.

Set of Course Goals/Objectives: By the end of the course, students will be able to: (1) describe the petroleum refinery processes in a modern refinery; (2) characterize crude oil as a mixture of pseudocomponents and to find the properties of the mixture; (3) use process simulation software to characterize and work with crude oils; and (4) perform a preliminary design of several of the important refinery processes, including a cash flow analysis and written report.

Prerequisites by Topic: senior standing in ChE: must have had stoichiometry, basic and ChE thermodynamics, heat transfer, mass transfer, and process component design

Major Topics Covered in the Course: (1) Refinery flow and products; (2) Crude-oil characterization, distillation curves, properties; (3) Pseudocomponent breakdown, properties of cuts; (4) Crude-oil distillation, prediction of products by hand method; (5) Simulation of atmospheric and vacuum crude distillation columns by HYSYS, heat balance on atmospheric fractionator; (6) Calculation and optimization of crude-oil/product heat-exchange train including a detailed cash-flow analysis; (7) Catalytic reforming; (8) Catalytic cracking; (9) Alkylation and isomerization; (10) Coking and visbreaking; (11) Hydrocracking; (12) Hydrotreating; (13) Lubricating oils; (14) Product blending; (15) Environmental aspects, reformulated gasoline, diesel fuel; (16) Refinery wastewater treatment; (17) Sulfur recovery

Class/Laboratory Schedule: Three (3) 50-minute lectures per week for 14 weeks

Professional Component Contribution: Three (3) hours of Engineering Science and Design