

ChE 4023 Gas-Processing Plant Design
Option for Required Elective for ChE program

Catalog Description: The application of chemical engineering and economic principles to the design of natural gas plant equipment; includes use of state-of-the-art simulation packages.
Prerequisite: Permission of instructor.

Recent Textbook: F.S. Manning and R.E. Thompson, "Oilfield Processing of Petroleum: Volume 1, Natural Gas", PennWell Publishing Co., 1991; R.E. Thompson, "Natural Gas Processing", O&GCI, 1995

Recent References: Gas Processors Suppliers Association, "Engineering Data Book", 12th ed., GPSA, 2004; HYSYS manual

Set of Course Goals/Objectives: By the end of this course, the student will be able to: (1) Evaluate and compare basic gas-processing schemes; (2) Design and optimize a proposed gas-processing plant; (3) Take incomplete design assignments and translate them into more complete assignments; (4) Make preliminary cost estimates for alternative processes; (5) Demonstrate an understanding of basic calculation and optimization techniques used in gas-processing plant design; (6) Incorporate writing skills, computer skills and a knowledge of safety and ethical concerns.

Prerequisites by Topic: (1) Stoichiometry; (2) Basic and advanced thermodynamics; (3) Heat transfer (heat exchanger design); (5) Mass transfer (stagewise operations)

Major Topics Covered in the Course: (1) Natural gas sources, composition, properties; specifications, nomenclature, special definitions; (2) Phase behavior and phase equilibrium calculations; (3) Gas processing schemes; (4) Gas liquids recovery using mechanical refrigeration and a cryogenic expander cycle; (5) Gathering and transportation, water content and hydrate formation and prevention; (6) Methods of gas dehydration; (7) Expansion turbines and compressors; (8) Flow line, separator, and exchanger sizing; (9) Demethanizer simulation; (10) Cost estimation: equipment costs, installed costs, operating costs, revenue, income tax, cash flow analysis, rate of return; (11) Gas treating: acid-gas removal; sulfur recovery; (12) Treating and handling of liquid products; (13) Extended processing: Ryan-Holmes, N₂ rejection, ethane rejection; (14) Guest lectures.

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

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