



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Chemical Engineering Economy and Strategy

CBE 4760

Credit Hours:

3.00 - 3.00

Course Levels:

Undergraduate (1000-5000 level)

Course Components:

Lecture

Course Description:

Economic and strategy considerations in research, development, design, and manufacturing in the chemical process industry.

Prerequisites and Co-requisites:

Prereq: 3610, and enrollment in CBE or EngPhysics major; or Grad standing; or permission of instructor.

Course Goals / Objectives:

- Master hierarchical design and heuristic approaches to develop and evaluate solutions for process flowsheet determination without extensive computational support
 - Master the basic techniques of economic evaluation, including accounting techniques, time value of money concept, taxes, investment, and profit assessment methods that include discounted cash flow, capitalized costs, and return on investment
 - Introduce preliminary techniques for using computer-aided process simulation including proficiency with a commercial simulation package, such as ASPEN
 - Be familiar with novel product and process design development
 - Be familiar with sizing, scale up and costing of various equipment as well as components of an overall plant investment
 - Demonstrate proficiency in addressing open-ended design problems based on ambiguous and incomplete data and make suitable/justifiable assumptions
 - Be exposed to the basic principles of optimizations strategies and finding an optimum solution
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Course Topics:

- Product and Process design: Introduction to Plant Design, Need for Product Design with examples, Step wise Process Design Development with example of Vinyl Chloride
- Detailed description of a novel Product design (Polylactic acid) and a novel Process Design (Ethyl Acetate)
- Flowsheet Synthesis and Development: Concepts of stepwise Hierarchical method for Process design, detailed heuristics and rules of thumb for every step, process flow diagrams
- Health and safety Hazards and other environmental considerations Cost and Asset Accounting: basic accounting relationships, balance sheets and income statements, accounting records, debits and credits, cost accounting methods, basic definitions
- Cost Estimation: general design considerations, cash flow diagrams, cost indexes, factor method, time factors, scale factors
- Interest and Investments: simple interest, compound interest, effective interest, continuous interest, annuities, present worth, perpetuities, capitalized costs, discounted cash flows Design Project description and group assignments
- Taxes, Profitability, and Depreciation: types of taxes, depreciation credit, types of insurance, computation of depreciation, service life, salvage value, present value, basic depreciation methods, MACRS.
- Alternative Investments: cost of capital, rate of return on investment, payout period, discounted cash flow, net present worth, capitalized cost
- Equipment Sizing: materials handling for pumps, compressors and mixers, Bernoulli and NPSH calculations for pumps, multistage compression, costing of pumps and compressors, ASPEN simulations for pump and compressor designs
- Chemical Reactors: fundamentals of reactor design, different types of reactors, costing. ASPEN simulations for reactor designs
- Heat Transfer equipment: Fundamentals of heat transfer and heat exchanger designs, different types of heat exchangers, costing
- Optimum Design and Design Strategy: optimization and objective function, linear programming and dynamic programming, Principle of Optimality, Theory of Reliability and solved examples
- Design Project discussion and review Team Activities: organization of teams, personality types, team behaviors, stages of team evolution, company requirements for team effectiveness
- Design Project discussion and review Presentation Techniques: effective presentation aids, analyzing an audience, persuasion strategies, delivery skills, speech writing and organization, library information resources

Designation:

Elective

Required