ECH 4615

Suggested outline for Design I and Design II

Fall 2004-Spring 2005

Prepared by Dr. Srinivas Palanki (April 28, 2004)

Text:

1. Analysis, Synthesis and Design of Chemical Processes, 2nd Ed., R. Turton, R. C. Bailie, W. B. Whiting, and J. A. Shaeiwitz, Prentice Hall PTR, Upper Saddle River, New Jersey 07458, 2003. ISBN: 0-13-064792-6
2. Fundamentals of Process Safety, Vic Marshall and Steve Ruhemann, IChemE ISBN: 0-85295-431-X

Detailed Course Material for Design I, ECH 4604 (4 credits):

1. Course Introduction
2. Diagrams for Understanding Chemical Processes
3. Structure and Synthesis of Process Flow Diagram
4. Application of Douglas Hierarchy
5. Tracing Chemicals through the Process Flow Diagram
6. Developing Unit Models for Linear Mass Balances
7. Linear Mass Balances
8. Review of Mass Transfer
9. Tearing algorithm to solve process flowsheet mass balance
10. Setting Temperature and Pressure Levels from Mass Balances
11. Review of Heat Transfer
12. Energy Balances
13. Illustrative Example of Mass and Energy balance of flowsheet
14. Understanding Process Conditions
15. Utilizing Experience-Based Principles
16. Review of Chemical Process Industries

17. Unconstrained Optimization
18. Optimization with Equality Constraints
19. Optimization with Inequality Constraints
20. Engineering Ethics

The software CHEMCAD would be used extensively in the course. There will be a final design project that will involve the use of "hand-calculations" using short-cut methods as well as a more detailed calculation using CHEMCAD.

Detailed Course Material for Design II, ECH 4615 (3 credits):

1. Process Troubleshooting and Debottlenecking
2. Estimation of Capital Costs
3. Estimation of Manufacturing Costs
4. Engineering Economic Analysis
5. Profitability analysis
6. Health, Safety and the Environment
7. Green Engineeering
8. Report Writing Fundamentals

All the above topics for Design II are separate chapters in the TBWS book. It is suggested that the AIChE design problem be assigned to the class as a final project. The students should be required to use CHEMCAD in the project.