THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Analysis of Chemical and Biomolecular Engineering Problems

CBE 8801

Credit Hours:
3.00 - 3.00

Course Levels:
Graduate (5000-8000 level)

Course Components:
Lecture

Course Description:
Modern techniques for the theoretical analysis of chemical and biomolecular engineering problems.

Prerequisites and Co-requisites:
Prereq: Grad standing.

Course Goals / Objectives:
- Be familiar with theoretical ideas that provide foundations of the analysis of chemical and biomolecular engineering problems, in particular those involving several simultaneously-occurring chemical reactions
- Be familiar with techniques for stability analysis of complex chemical reactors
- Be prepared for further study of advanced theoretical methods taught both witin Chemical and Biomolecular Engineering and in other departments of the university

Course Topics:

- Highlights of Modern Linear Algebra
- Mappings and their Classification
- Application: The Stoichiometry of Complex Chemical Reactors A. Stoichiometry based on atomic balance B. Stoichiometry based on a presumed network of chemical reactions
- Application: Conditions on rate constants that ensure detailed balancing in complex mass action chemical systems.
- Linear Analysis as a Foundation for the Study of Nonlinear Problems.
- The Differential Equations of First-Order Chemical Reaction Networks A. The case of real eigenvalues B. The case of complex eigenvalues
- Chemical Reaction Networks Giving Rise to Nonlinear Systems of Ordinary Differential Equations A. Some examples of complex chemical reactors governed by nonlinear systems of differential equations
- Chemical Reaction Networks Giving Rise to Nonlinear Systems of Ordinary Differential Equations B. The stability of equilibria C. Phase portraits for some complex chemical reactors
- Chemical Reaction Networks Giving Rise to Nonlinear Systems of Ordinary Differential Equations D. A chemical reactor exhibiting a Hopf bifurcation E. Dynamical consequences of detailed balance.

Designation:
Required