CH235 Aug 3:0

Modelling in Chemical Engineering

Instructor

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Department: Chemical Engineering

Course Time: MWF: 10-11 AM

Lecture venue: Lecture Hall, Chemical Engineering

Detailed Course Page:

Announcements

Brief description of the course

The course aims to initiate students into analyzing processes in terms of the underlying significant steps and converting these into mathematical relationships, which can be solved as a self-contained set of expressions on computer, to establish if the qualitative thinking with hidden hypotheses and assumptions is correct. The processes could be physical, chemical, biological, or a combination of these. The mathematical description, aimed at capturing the essence with simplicity and careful approximations but no simpler than that (therefore different from CFD), could be in terms of algebraic relations, ordinary differential equations, or a system of partial differential equations. The processes could be described in terms of mean quantities, or necessitate stochastic description. Description of systems with particulate species, such as bubble, drops, particles, cells, polymers, etc., may be possible through an average particulate species or may require distinctions among them to be formally recognized in mathematical description. The course progresses by taking on modelling challenges of one kind to the next, with their careful sequencing. Examples which show that an in depth quantitative understanding of one process can lead to new ways experimentally probing another process are

also taken up.

Prerequisites

None. Senior year UG, postgradates

Syllabus

Model development principles; classification of models, modelling of complex systems of interest to engineers through lumped parameter models, distributed parameter models, continuum models, stochastic models, population balance models, kinetic Monte Carlo models, network models, unit models, and element models.

Course outcomes

A student should be able to analyze a complex system at hand, in general area of interest to chemical engineers, identify/hypothesize equilibrium steps, rate processes, driving forces at work, and coupling/inter-dependence among them, and express this understanding in terms of mathematical relationships by making use of established physical laws. The set of mathematical relationships, complete with initial and boundary conditions, and constitutive and equilibrium relationships, should be solvable to make quantitative predictions to test validity of model, explain existing observations, and make new predictions to either aid in engineering design and control or establish model through experimental corroboration.

Grading policy

Assignments: 20%

Tests: 30%

Project: 20%

Final: 30%

Assignments

Resources

Notes provided by the instructor.