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OCH751 PROCESS MODELING AND SIMULATION

DETAILED SYLLABUS

OBJECTIVE:

- To give an overview of various methods of process modeling, different computational techniques for simulation.

UNIT I INTRODUCTION

Introduction to modeling and simulation, classification of mathematical models, conservation equations and auxiliary relations.

UNIT II STEADY STATE LUMPED SYSTEMS

Degree of freedom analysis, single and network of process units, systems yielding linear and nonlinear algebraic equations, flow sheeting – sequential modular and equation-oriented approach, tearing, partitioning and precedence ordering, solution of linear and non-linear algebraic equations.

UNIT III UNSTEADY STATE LUMPED SYSTEMS

Analysis of liquid level tank, gravity flow tank, jacketed stirred tank heater, reactors, flash and distillation column, solution of ODE initial value problems, matrix differential equations, simulation of closed loop systems.

UNIT IV STEADY STATE DISTRIBUTED SYSTEM

Analysis of compressible flow, heat exchanger, packed columns, plug flow reactor, solution of ODE boundary value problems.

UNIT V UNSTEADY STATE DISTRIBUTED SYSTEM & OTHER MODELLING APPROACHES

Analysis laminar flow in pipe, sedimentation, boundary layer flow, conduction, heat exchanger, heat transfer in packed bed, diffusion, packed bed adsorption, plug flow reactor. Empirical modeling, parameter estimation, population balance and stochastic modeling.

OUTCOME:

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- Upon completing the course, the student should have understood the development of process models based on conservation principles and process data and computational techniques to solve the process models.

TEXT BOOKS:

1. Ramirez, W.; "Computational Methods in Process Simulation ", 2nd Edn., Butterworths Publishers, New York, 2000.

2. Luyben, W.L., "Process Modelling Simulation and Control ",2nd Edn, McGraw-Hill Book Co., 1990

REFERENCES:

1. Felder, R. M. and Rousseau, R. W., "Elementary Principles of Chemical Processes ", John Wiley, 2000.

2. Franks, R. G. E., "Mathematical Modelling in Chemical Engineering ", John Wiley, 1967.

3. Amiya K. Jana,"Process Simulation and Control Using ASPEN", 2nd Edn,PHI Learning Ltd (2012).

4. Amiya K. Jana,"ChemicalProcess Modelling and Computer Simulation" 2nd Edn,PHI Learning Ltd,(2012).

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