UCH1603 Process Dynamics and Control

Introduction to the Course

Dr. M. Subramanian

Department of Chemical Engineering
SSN College of Engineering
subramanianm@ssn.edu.in

January 20, 2021

Topics

Unit-I Introduction to Process Dynamics, and Review of Laplace Transforms

Unit-II Open Loop Systems (Dynamics of Uncontrolled Systems)

Unit-III Closed Loop Systems (Dynamics of Controlled Systems)

Unit-IV Stability

Unit-V Advanced Control Systems

UCH1603 Process Dynamics and Control

Unit-I Introduction

Incentives and Design aspects of Process Control, Development for mathematical Model for Reactor and Distillation column. Laplace transformation and its application in process control.

Unit-II Open Loop Systems

Steady state and dynamic models of first order systems and their transient response for standard input functions, first order systems in series, linearization and its application in process control, second order systems and their dynamics; transportation lag.

Syllabus Contents (contd..)

Unit-III Closed Loop Systems

Closed loop control systems, development of block diagram for feed-back control systems

Modes of control action.

Classification of controllers and control strategy.

Servo and regulatory problems.

Transfer function for controllers and final control element,

Principles of pneumatic and electronic controllers.

Transient response of closed-loop control systems.

Univ-IV Stability

Routh stability criterion

Controller tuning and design, Online tuning- closed loop and open loop methods.

Frequency response technique: Phase margin and gain margin; Bode stability criterion; Nyquist stability criterion; Controller design.

Root locus plot and stability analysis.

Syllabus Contents (contd..)

Unit-V Advanced Control Systems

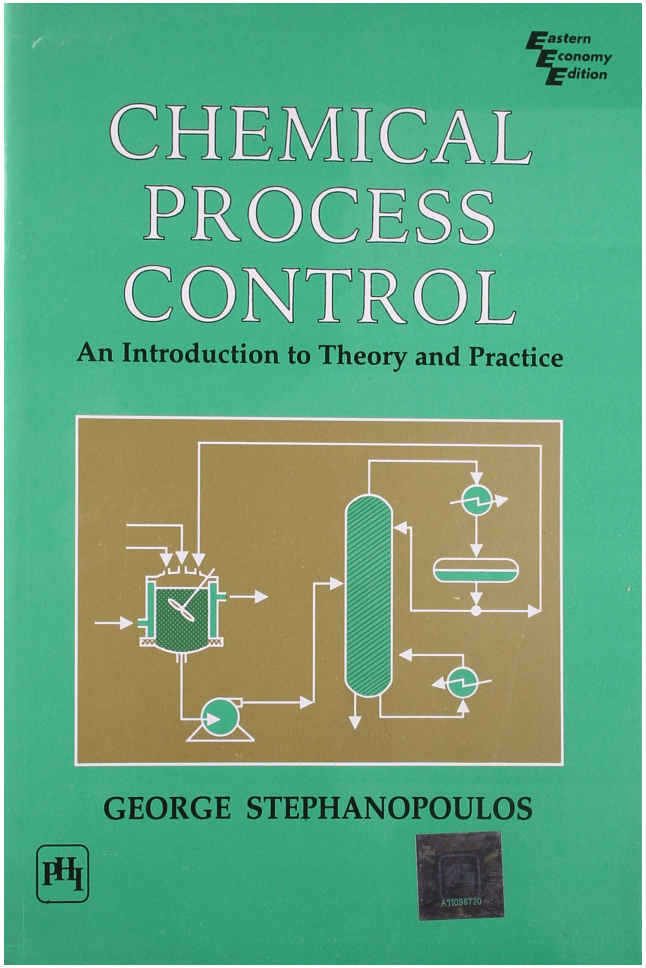
Introduction to advanced control systems - Cascade control, feed forward control, Smith predictor.

Control of distillation towers and heat exchangers.

Introduction to computer control of chemical processes.

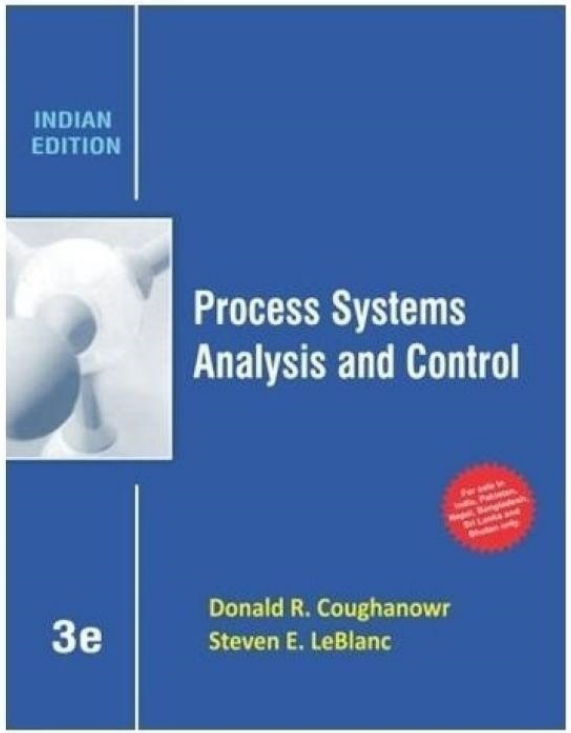
Books

- Stephanopoulos, G., "Chemical Process Control", Prentice Hall of India, 2003.



Books (contd..)

- Coughnowr, D., "Process Systems Analysis and Control", 3rd Edn., McGraw Hill, New York, 2008.



Contact Hours

Day	Period
Mon	11:00 - 12:00
Tue	-
Wed	9:45 - 10:45
Thurs	-
Fri	8:30 - 9:30

Features of the Process Control Course

- The courses so far (such as Thermodynamics, Fluid Mechanics, Heat Transfer, Mass Transfer, etc.) studied are based mostly on steady state calculations.
- Process Control course involves understanding the unsteady operation of the plant; and about maintaining the plant at near steady state using control elements.
- Mathematical representation of unsteady operation leads to differential equations. Laplace transform is used to convert the differential equation to algebraic equation.
- The resulting algebraic equations are written as transfer function forms (output / input) and represented as block diagrams.