ADVANCED PROCESS CONTROL

Course Code: 13CH2112

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PREREQUISITES: The student should have knowledge of basics of control system and Laplace transforms.

Course Educational Objectives: This course enables the student

1. To design a controller to a single input single output and multi input and multi output plant.
2. Be able to understand the limitations of a controller design.

Course Outcomes: After completion of the course the student would be able to

1. Design a controller using advanced controller methods.
2. Understand the effect of model uncertainty in controller design.

UNIT-I

Review of single input single out put (SISO) systems, Routh stability criteria. Frequency Response Analysis: Bode and Nyquist plots, effect of process parameters on Bode and Nyquist plots, closed loop stability concepts, Bode and Nyquist Stability.

UNIT-II

Internal Model control: Introduction to model based control, practical openloop controller design, generalization of the open-loop control design procedure, model uncertainty and disturbances. The IMC structure, IMC design procedure, effect of model uncertainty and disturbances. IMC in context of PID controller.

UNIT-III

Control-loop Interaction: Introduction, Motivation, the general pairing problem, the relative gain array, properties and application of the RGA. Multivariable Right Half Plane (RHP) Zeros and their performance limitations, Design of ideal Decouplers.

UNIT-IV

Model Predictive Control: Models forms of model predictive control, constrained and unconstrained approach, analysis of dynamic matrix control.

UNIT-V

State space and transfer function representation and their interrelationships. Sampling and Z-transforms, Open loop and closed loop response.

TEXT BOOKS

1. Wayne Bequette B., *"Process control: Modeling, Design and simulation",* PHI, 2003.

2 Stephanopoulos,*"Chemical Process Control: An Introduction to theory&Practices",*PHI,2010

REFERENCES:

1. Ogunnaike, B,. Ray W H, *"Process Dynamics, Modeling and Control",* Oxford University Press, 1994.

2. Seborg D.E. and Edgar T.F., Mellichamp D.A *"Process Dynamics and control",* Wiley, 2006.

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