

Advanced Control Systems - Video course

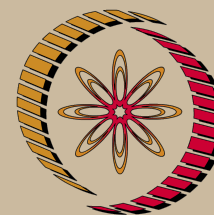
COURSE OUTLINE

The elective course in electrical/electronics and communication engineering "Advanced Control Systems" introduces the fundamental concepts, principles and application of advanced control system analysis and design to the postgraduate students.

The course material shall include the topics : configurations of controllers, time and frequency domain performance measures, PID control of SISO systems and TITO systems, PID controller, its variants and limitations, PI-PD control, effects of measurement noise and load disturbances, plant model identification, frequency domain based identification, off-line and on-line identification, accuracy of identification and sensitivity, time domain based identification, state space based identification methods, accuracy of identification and sensitivity, model based controller design, model-free controller design, automatic and on-line tuning of controllers, real time applications of the control algorithms, Field programmable analog/digital array based design of controllers.

COURSE DETAIL

Sl. No.	Module 1: Model Based Controller Design/ Lecture Topics	No. of (Total) Hours
1	Introduction	1
2	Control structures and performance measures	1
3	Time and frequency domain performance measures	1
4	Design of controller	1
5	Design of controller for SISO system	1
6	Controller design for TITO processes	1
7	Limitations of PID controllers	1
8	PI-PD controller for SISO system	1
9	PID-P controller for Two Input Two Output system	1
10	Effects of measurement noise and load	1



NP-TEL

NPTEL

<http://nptel.iitm.ac.in>

Electrical Engineering

Pre-requisites:

Control Systems
Engineering - I.

Additional Reading:

Cheng Ching Yu,
Autotuning of PID
controller, Springer-
Verlag, 1999.

Hyperlinks:

ni Logic, An application
note to FPAA technology,
www.ni2designs.com

Coordinators:

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Sl. No.	Module 2: Frequency Domain Based Identification/ Lecture Topics	No. of (Total) Hours
1	Identification of dynamic models of plants	1
2	Relay control system for identification	1
3	Off-line identification of process dynamics	1
4	On-line identification of plant dynamics	1
Sl. No.	Module 3: Time Domain Based Identification / Lecture Topics	No. of (Total) Hours
1	State space based identification	1
2	State space analysis of systems	1
3	State space based identification of systems -1	1
4	State space based identification of systems -2	1
5	Identification of simple systems	1
6	Identification of FOPDT model	1
7	Identification of second order plus dead time model	1
8	Identification of SOPDT model	1
9	Steady state gain from asymmetrical relay test	1
10	Identification of SOPDT model with pole multiplicity	1
11	Existence of limit cycle for unstable system	1
12	Identification procedures	1
13	Identification of underdamped systems	1
14	Off-line identification of TITO systems	1

15	On-line identification of TITO systems	1
16	Review of time domain based identification	1
17	DF based analytical expressions for on-line identification	1
18	Model parameter accuracy and sensitivity	1
19	Improved identification using Fourier series and wavelet transform	1
20	Reviews of DF based identification	1
Sl. No.	Module 4: Design of Controllers / Lecture Topics	No. of (Total) Hours
1	Advanced Smith predictor controller	1
2	Design of controllers for the advanced Smith predictor	1
3	Model-free controller design	1
4	Model based PID controller design	1
5	Model based PI-PD controller design	1
6	Tuning of reconfigurable PID controllers	1
	Total	40 Hours

References:

1. S. Majhi, Advanced Control Theory-Relay Feedback Approach, Cengage Asia/India Pvt.Ltd, 2009.
2. A. Johnson and H. Moradi, New Identifications and Design Methods, Springer - Verlag, 2005.
3. Norman S. Nise, Control Systems Engineering, John Wiley & Sons, 2008.