# IN227 Jan. 3:0

# Control System Design

## Instructor

G. R. Jayanth
Email: jayanth@iisc.ac.in

## Teaching Assistant

Email:

**Department: Instrumentation and Applied Physics**

Course Time: Tue., Thu., 10:00-11:30AM

Lecture venue:

Detailed Course Page:

## Announcements

## Brief description of the course

The course exposes students to control design for continuous-time linear time-invariant (LTI) systems. The course focuses primarily on using Laplace and frequency-domain techniques. It discusses design of 1-degree of freedom and 2-degree of freedom control systems, using a range of tools including Nyquist plots, Bode plots, Evans plots (root locus), and Nichols plots. It also discusses the fundamental limits associated with control design and the related trade-offs that need to be made during design.

## Prerequisites

None

## Syllabus

Dynamics of linear systems, Laplace transforms, analysis and control of feedback control systems using Nyquist plots, Bode plots and Root Locus, design of control systems in single-degree of-freedom configuration, proportional-integral-derivative control, lead-lag compensation, design of control systems in two-degree of-freedom configuration to achieve

robustness, quantitative feedback theory, control of nonminimum phase

systems, bode sensitivity integrals, use of describing functions to

analyze and compensate nonlinearities.

## Course outcomes

At the end of the course the student would be able to do the following:

(1) The use and significance of the different tools for control system design and analysis such as Nyquist plots,

Bode plots, Evans plots (root locus), and Nichols plots

(2) Undertake systematic design of 1-DOF control systems

(3) Employ controllers such as PID and Lead-Lag for control design

(4) Undertake systematic design of 2-DOF control systems

(5) Understand the fundamental limitations associated with control of LTI systems

(6) Understand the special issues associated with non-minimum phase systems and unstable systems

## Grading policy

60% assignments, 20% midterm examination and 20% end-term examination

## Assignments

## Resources