CONTROL SYSTEM DESIGN

PROF. G.R. JAYANTH
Department of Electrical and Electronics Engineering
IISc Bangalore

PREREQUISITES: One undergraduate-level course exposing students either to Laplace transforms or control systems

INTENDED AUDIENCE: Aerospace, Electrical and Electronics, Mechanical and Chemical Engineering

COURSE OUTLINE :

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 (i.e., single controller) and 2-degree of freedom control systems for Single Input-Single Output (SISO) plants, 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.

ABOUT INSTRUCTOR :

G. R. Jayanth obtained his B. Tech from IIT Madras in 2002, MS and PhD from The Ohio State University in 2004 and 2008 respectively, all in Mechanical Engineering. Since 2010 he has been with Indian Institute of Science where he is currently an Associate Professor in the Department of Instrumentation and Applied Physics. His research interests include precision motion measurement and control, nanometrology and manipulation, scanning probe microscopy, micro-robotics and optical sensors.

COURSE PLAN :

Week 01 : Linear system theory, Fourier and Laplace transforms, Transfer functions
Week 02 : Fundamentals of feedback control, Nyquist stability theory
Week 03 : Bode plots, Design of 1-degree of freedom control systems
Week 04 : Design of 1-degree of freedom control systems
Week 05 : Robust control
Week 06 : Quantitative Feedback Theory
Week 07 : Quantitative Feedback Theory, Bode sensitivity integral
Week 08 : Bode Gain-Phase relationship, Ideal Bode Characteristic
Week 09 : Control of non-minimum phase systems
Week 10 : Control of unstable systems
Week 11 : Describing functions, Solved examples
Week 12 : Solved examples