CONTROL ENGINEERING

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PRE-REQUISITES : Network and Circuits, Basic Engineering Mathematics.

INTENDED AUDIENCE : Network and Circuits, Basic Engineering Mathematics. we suggest the NPTEL course on Networks and Systems by Dr.V.G.K.Murti. Content in Lectures 1 -6 and 20-29 will be relevant for this course.

INDUSTRIES APPLICABLE TO : Any industry into Industrial Automation.

COURSE OUTLINE :

This course shall introduce the fundamentals of modeling and control of linear time invariant systems; primarily from the classical viewpoint of Laplace transforms and a brief emphasis on the state space formulation as well. The course will be useful for students from major streams of engineering to build foundations of time/frequency analysis of systems as well as the feedback control of such systems. The 11th module of the course will cover a detailed application of filter design in the field of navigation and human movement (gait). Students will be able to design their very own basic navigational system using inertial sensors and microcontrollers.

ABOUT INSTRUCTOR :

Prof. Ramkrishna Pasumarthy is an Associate Professor at the Dept. of Electrical Engineering, IIT Madras. He obtained his PhD in Systems and Control at the University of Twente, The Netherlands and held postdoc positions at the University of Melbourne and UCLA. He held visiting positions at Stanford University. His research interests are in the areas of network science with applications to power, traffic cloud and brain networks. also associated with the Robert Bosch Center for Data Sciences and Artificial Intelligence at IIT Madras. He also has interests in medical wearable devices and is a co founder of a start up iMov Motion Tech pvt. ltd. incubated at IITM Research Park

COURSE PLAN :

Week 1: Mathematical Modelling of Systems

Week 2: Laplace Transforms, transfer functions, block diagram representation.

Week 3: Block diagram reduction, Time response characteristics.

Week 4: Introduction to stability, Routh Hurwitz stability criterion.

Week 5: Root locus plots, stability margins.

Week 6: Frequency response analysis: Nyquist stability criterion, Bode plots and stability margins in frequency domain.

Week 7: Basics of control design, the proportional, derivative and integral actions.

Week 8: Design using Root Locus

Week 9: Design using Bode plots

Week 10: Effects of zeros, minimum and non-minimum phase systems.

Week 11: State space analysis

Week 12: Design using State space