SC 301 – Linear and Nonlinear Systems

Instructors:

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Topics (Part I – Linear Systems):

1. ODE existence and uniqueness
2. LTV state transition matrix properties - flow of linear systems
3. Controllability - controllable and uncontrollable eigenvalues/subspaces, invariant sets, Grammian, Kalman decomposition.
4. Observability - observable and unobservable subspaces/eigenvalues, invariant sets, Grammian, Kalman decomposition.
5. Lyapunov functions for stability analysis
6. Specialization to eigenvalues for LTI case
7. Linear feedback - LTI pole placement via canonical forms, LQR
8. Linear feedback for time varying systems - LQR
9. Output feedback via estimation - luenberger for LTI
10. Linear systems stabilising feedback design with singular gains

Above will be subject to availability of time.

Topics (Part II – Nonlinear Systems):

Check for updates on Ravi's webpage
http://www.sc.iitb.ac.in/~banavar/styled-4/index.html

References:

Linear System Theory - Wilson J. Rugh, Prentice Hall, 2nd Edition, 1995
Linear System Theory and Design - C. T. Chen, Oxford University Press, 2nd Editions, 1995
Linear Systems - Thomas Kailath, Prentice-Hall, Inc.; 1st Edition, 1980

Teaching Assistants:

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Evaluation Scheme (Entire Course):

Quizzes (2 nos., Surprise quizzes) - 45 %
Assignments - 10%
Class participation - 10 %
Final Project – 35%

(No mid-sem or end-sem)