Prof Incharge: Dr. Tushar JAIN (Assistant Professor, IIT Mandi)

Topic Name: Stability Analysis

Course Name: Control Systems

Prerequisites: Network analysis / Signals and systems

Intended for: B.Tech (Electrical, Electronics, Mechanical, Instrumentation, Aerospace, Production and Industrial) 3rd and 4th year.

Preamble:
A very important aspect of the dynamic behavior of a system is: when a (finite) input change is implemented on a physical system, does the resulting transient response ultimately settle to a new steady state, or does it grow indefinitely? If it is indeed possible for a dynamical system not to settle eventually to another steady state, but have its output grow indefinitely when disturbed from an initial steady state, what characteristics of the system determine whether or not such behavior will occur? This course is primarily concerned with investigating those issues having to do with the stability properties of linear dynamical systems.

Course Outline:
- Introduction and Origin of Stability Analysis
- Routh-Hurwitz Criterion and Analysis
- Stability analysis using Root-locus method
- Nyquist Stability Criterion and Analysis
- Stability Margins
- Relative Stability
- Input-Output stability
- Stability in the Presence of Uncertainty

Reference:
1. Norman N. Nise. Control Systems Engineering. John Wi ley & Sons, Inc. sixth edition, 2011.
2. Astrom, Karl Johan, and Richard M. Murray. Feedback systems: an introduction for scientists and engineers. Princeton university press, 2010.
http: //www.cds.caltech.edu/-murray/amwiki/index.php/Second Edition
3. C. G. Kang, "Origin of Stability Analysis: "On Governors" by J.C. Maxwell [Historical Perspectivesj," in IEEE Control Systems, vol. 36, no. 5, pp. 77-88, Oct. 2016.