AUTOMATIC CONTROL ENGINEERING

ENGINEERING 6951

Course Content [# lectures]

Background: [1] The feedback control concept would be introduced.

Controllers: [4] The Proportional Integral Derivative or PID controller would be discussed. A special set of PID gains known as Ziegler Nichols gains would be presented. The influence of nonlinear phenomena would be discussed. A special gain for nonlinear controllers known as the Describing Function would be given.

Simulation: [4] Time stepping procedures that allow behavior to be seen step by step in time would be presented. MATLAB would be used to do calculations based on simulation templates. SIMULINK would also be used for this.

Performance: [4] Responses of systems would be obtained using Partial Fraction Expansion or PFE and Inverse Laplace Transformation or ILT.

Stability: [8] Various procedures for examining the stability of control systems would be presented. The focus would be on the Nyquist procedure. The concept of stability margins would be presented.

Case Studies: [2] Several control system case studies would be presented.

Learning Outcomes

After this course, the student would be able to:

1. Understand the feedback control concept.
2. Calculate PID gains for control systems.
3. Calculate limit cycles for control systems.
4. Understand time stepping templates.
5. Calculate responses using templates.
6. Calculate responses using SIMULINK.
7. Calculate responses using PFE and ILT.
8. Understand stability mathematically.
9. Understand and apply Routh Hurwitz.
10. Understand and apply Root Locus.
11. Understand and apply Nyquist.
12. Design simple control systems.