Adaptive Control Theory (SC 617)

This course that delves into adaptive control design and analysis for uncertain parameter dynamical systems. Rigorous theoretical background in the area will be developed along with applied examples of adaptive control design.

Semester: Spring 2013

Credit Structure: L-3 T-0 P-0 C-6

Class Logistics: Mondays and Thursdays, 2:00-3:30 pm in LCC 12 (Lecture Hall Complex)

Instructor: Dr. S. Srikant (Room 204 A, Systems and Control Engg.)

Office Hours: By appointment through email (srikant@sc.iitb.ac.in)

Prerequisites:

Graduate level competence in ordinary differential equations and linear systems/control theory is expected. If you are unsure of your academic preparation then kindly contact me.

Also basic MATLAB (or other similar mathematical software) programming competence is expected.

Topics:

Lyapunov Stability Analysis and Barbalat's Lemma
Non-Strict Lyapunov functions and Lyapunov-like analysis
Filter Construction
Parameter Adaptive Control
Certainty Equivalence technique
Non-Certainty Equivalence technique
Aero-Mechanical System Applications
High-frequency gain adaptation
Parameter projection in adaptive control
Robustness modification
Adaptive Observers
Additional topics time permitting

Books and References:

There is no compulsory text for this course and the class notes (derived from the Nonlinear/Adaptive control course by Prof. Maruthi Akella at UT Austin) will be comprehensive. However, the following references are suggested as additional sources of information on the topic,

P. Ioannou and J. Sun, Robust Adaptive Control, Upper Saddle River, NJ: Prentice Hall 1996
S. Sastry and M. Bodson, Adaptive Control: Stability, Convergence and Robustness, Upper Saddle River, NJ: Prentice Hall 1989
K. S. Narendra and A. M. Annaswamy, Stable Adaptive Systems, Dover Publications, 2005
H. K. Khalil, Nonlinear Systems, Upper Saddle River, NJ: Prentice Hall 2002

Grading Policy:

Homeworks: 30%

Mid Semester Exam (2 exams): 40%

End Semester Project/Exam: 30%