ENSC 801(FALL 2005)- Linear Systems Theory

Instructor: Mirza Faisal Beg

Course description

This course is aimed towards study of techniques used in linear systems theory and its applications into state space analysis of systems. The first part of this course will cover the fundamental concepts of linear vector space theory and elementary functional analysis. Topics include vector spaces, subspaces, normed linear spaces, transformations and continuity, completeness, Banach spaces, inner product and Hilbert spaces, projection theorem, least squares estimation, dual spaces, and linear operators and adjoints. The second part of the course, if time permits, will cover analytical representation of linear systems, state space formulation, solution of the state equation, determination of the system's response, controllability, observability, stability, duality, canonical forms, and minimal realization.

Pre-requisites

Proficiency expected with calculus and linear algebra.

Course References

There is no single text we will follow for this course. The concepts from linear systems theory will be covered from the first text referenced below and state space analysis from the second.

- Chapters 1 - 6 from Optimization by vector space methods by Luenberger, published by John Wiley, ISBN 047118117X.
- Selected chapters from Linear System Theory, second edition, Wilson J. Rugh, published by Prentice Hall, ISBN 0-13-441205-2.
- Ordinary Differential Equations by V. I. Arnold, published by MIT press, 1978, ISBN 0-262-51018-9.
- A vector space approach to models by Nelson Dorny. Out of print but first five chapters available free online at "http://www.seas.upenn.edu/ dorny/VectorSp/VSFrameset.htm".

Course Webpage

The course will have webpage setup on webCT. Assignments will be handed out on the course webpage at 12 pm on Friday and will be due in electronic format on webCT assignment submission page after one or two weeks at 12 pm on the Friday of that week. WebCT assignment submission pages timeout after the deadline so please make sure to submit the assignment well in time. Assignments not submitted online in the allocated time will not be considered for grading without exception.

Office Hours

Monday 2 to 4 pm in ASB 8855 (subject to change pending your input on your availability).

Grading Policy

30% Final, 30%Midterm, 40% Homework.