SYST611: System Methodology and Modeling

Spring 2008

Instructor: Dr. Frederick Wieland **Class room: Robinson, B222**
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News

Lecture 1	Lecture 2	Lecture 3	Lecture 4	Lecture 5	Lecture 6
Lecture 7	Lecture 8	Lecture 9	Lecture10	Lecture11	Lecture12

Homework 1	Homework 2	Homework 3	Homework 4	Homework 5
Solution 1	Solution 2	Solution 3	Solution 4	Solution 5

Course Description

This course provides a broad, yet rigorous, introduction to modeling and methodologies for Systems Engineering. Emphasis is on systems modeling and performance. These methodologies address system performance issues and assist in the evaluation of alternative system designs. Resource allocation for planning and control is also introduced. This is a *required* basic method course for Systems Engineering MS program.

Prerequisite

SYST500 or appropriate mathematical foundation including calculus, differential equations, matrix algebra, and applied probability.

Course Assignments and Grading

This course will have homework assignments, a mid term, and a final exam. They will constitute 30%, 30%, and 40% of the grade, respectively. The homework that is assigned in the lecture is due in two weeks.

Course Materials

1. David Luengerger, ***Introduction to Dynamic Systems***, Wiley,1979.
2. Joseph J. DiStefano, III, et al. ***Theory and Problems of Feedback and Control Systems***. 2rd Edition, Schaum's outline series, McGraw-Hill, 1994

References (not required)

1. Bradley W.Dicknson, ***Systems-Analysis,Design,and Computation***. Prentice Hall Inc.,1991
2. Naim A. Kheir, ***Systems Modeling and Computer Simulation***, Dekker, 2nd ed., 1996.

Tentative Course Outline

	Topics	Assignments
Unit #1	Introduction, Course Overview and Prerequisite, Taxonomy of Models and Methods, Systems Concept and Fundamentals	DL:Ch. 1-3 JD:Ch. 1-3, Class notes Examples (MATLAB)
Unit #2	Discrete Linear Systems, Input-Output and States, Stability, Computational Approaches, Interconnected Systems and Block Diagram	DL:Ch. 4.1-4.5 JD:Ch. 4-6, Class notes BD:p.79-98
Unit #3	Continuous Linear Systems, Stability Issues, Systems Characteristics in Various Domains, Discretization of Continuous Systems, Sampling Theorem	DL:Ch. 4.6-4.7, 5.9 JD:Ch. 5,10,15 Class notes
Unit #4	Discretization Techniques Analysis, Stability, Nonlinear Systems, Solution of Nonlinear Systems, Iterated Numerical methods	Class notes JD:Ch. 19.1-2 BD:p.124-138, 159-179 Example (MATLAB)
Unit #5	System Linearization and Stability, System Behavior and Phase Plane Analysis, Input-Output Analysis; Piece wise Linear	DL:Ch. 9.1-9.4 JD:Ch. 19.3-4 BD: p.180-202 Examples (MATLAB)
Unit #6	Discrete Event Dynamic Systems; Overview of Deterministic Systems, Discrete, Continuous; Linear, Nonlinear; Discretization, Linearization; Stability; Computational Issues	Class notes
	Mid term Examination	Units 1-6
Unit #7	Introduction to Uncertainty and Stochastic Process, Noisy Linear Systems	Class notes Examples (MATLAB)
Unit #8	Markov Process and Markov Chains, Systems Reliability	DL:Ch. 7 Class notes
Unit #9	Resource Allocation problems, Parameter Optimization, Constraints	Class notes BD:p234-254
Unit #10	Linear Programming, Systems Engineering Applications, Case Study	Class notes Examples (Excel)
Unit #11	Dynamic Programming, Systems Engineering Applications, Network Problem	Class notes
Unit #12	Optimal Control	DL:Ch. 11, Class notes Example (MATLAB)
	Course Review	Class notes
	Final Examination	Units 1-12

Final Examination, Units 1-12