SYST611: System Methodology and Modeling

Class room: Robinson, B222

Spring 2008

Instructor: Dr. Frederick Wieland

Class time: T, 7:20~10:00 PM fredwieland@hotmail.com http://classweb.gmu.edu/fwieland

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 <u>MS program</u>.

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

David Luengerger, *Introduction to Dynamic Systems*, Wiley, 1979.
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.

TopicsAssignmentsUnit #1Introduction, Course Overview and Prerequisite, Taxonomy of Models and Methods, Systems Concept and FundamentalsDL-Ch. 1-3 DL-Ch. 1-3, Class notes Examples (MATLAB)Unit #2Discrete Linear Systems, Input-Output and States, Stability, Computational Approaches, Interconnected Systems and Block DiagramDL-Ch. 4-4-4.5 JDC:h. 4-6. Class notes BD-p.79-398Unit #3Continuous Linear Systems, Stability Issues, Systems Characteristics in Various Domains, Discretization of Continuous Systems, Sampling TheoremDL-Ch. 4-6-47, 5.9 JD.Ch. 510.15 Class notes JD.Ch. 510.15 Class notes DD-p.79-398Unit #4Discretization Techniques Analysis, Stability, Nonlinear Systems, Solution of Nonlinear Systems, Iterated Numerical methodsClass notes JD.Ch. 91-9.4 JD.Ch. 91-12 BD-p.124-138, 159-179 Examples (MATLAB)Unit #5System Linearization and Stability, System Behavior and Phase Plane Analysis, Input-Output Analysis; Piece wise LinearD.Cch. 9.1-9.4 BD.ch. 91-34 BD.p.180-302 Examples (MATLAB)Unit #6Discrete Event Dynamic Systems; Overview of Deterministic Systems; Discrete, Continuous; Linear, Nonlinear; Discrete, Continuous; Linear, Nonlinear; Discrete, Continuous; Linear, SystemsClass notes Examples (MATLAB)Unit #7Introduction to Uncertainty and Stochastic Process, Noisy Linear SystemsClass notes Examples (MATLAB)Unit #8Markov Process and Markov Chains, Systems ReliabilityDL-Ch. 7 Class notesUnit #9Resource Allocation problems, Parameter Optimization, ConstraintsClass notes Examples (MATLAB)<		Ternative Course Outline					
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#12 Example (MATLAB)		Engineering Applications, Network	Class notes				
		Optimal Control					
Course Review Class notes		Course Review	Class notes				
Final Examination Units 1-12		Final Examination	Units 1-12				

Tentative Course Outline