Prepared by G.E. Louis – July 3, 2005

Systems & Information Engineering: SYS-201, Systems Engineering Concepts

Tuesdays and Thursdays 1400-1515, 15:30-16:45 - Room OLS 120

Instructors	**TA**
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Course Goal and Objectives:
The goal of this course is to develop the student's mastery of the philosophy, general approach, and basic analytical tools of systems engineering. This goal is achieved through four objectives: (i) to ground students in the history and philosophy that underpin the practice of systems engineering; (ii) to develop students' capability to use a systems engineering approach to design and solve problems; (iii) to introduce students to systems modeling and the basic analytical tools used in systems engineering problem solving; and (iv) to build effective written and oral communication skills in students' Students will achieve the course goal and objectives by working on case studies from real world systems engineering practice and by the completion of a team-based course project.
Course Designation: Required for SIE Majors. **Prerequisites**: APMA 111, 212

Course Description:
Three major dimensions of systems engineering will be covered, and their efficacy demonstrated through case studies: (1) The history, philosophy, art, and science upon which systems engineering is grounded; including guiding principles and steps in the "systems engineering approach" to problem solving; (2) The basic tools of systems engineering analysis, including; goal definition and system representation, requirements analysis, system assessment and evaluation, mathematical modeling, and decision analysis; and (3) system and project planning and management.

GRADING

Exam 1	25%
Exam 2	25%
Exam 3	20%
Project Presentation	10%
Project Report	15%
Quizzes	5%

Required Textbooks:
Khisty, C. J., *Fundamentals of Systems Engineering*, Prentice Hall, Upper Saddle River, NJ, 2001.
Gibson, J., *How to Do A Systems Analysis*, UVA Systems Engineering, 1981.
Other readings on Toolkit.

Professional Component: This course introduces students to the discipline of Systems Engineering and its practice, through the application of analytical tools, teamwork, and communication skills.

Program Outcomes Served: Students completing SYS 201-2 will be familiar with the math tools (**1a**) common to modeling complex systems and to the data analysis required to support such models (**2a, 2b**). They will be familiar with systems lifecycle design (**2c**) and the societal, environmental, and economic context for systems design (**2e**). Students will study in depth the range of engineering applications for a systems approach to problem solving (**1c**) and receive extensive practice in multidisciplinary teamwork, (**3b)** written and oral presentation skills (**3c**). Students will be exposed to the science fundamentals of relevant topics covered in the course (**1b**).

Project Report Formatting:

- Cover Page – Project Title, Name of team members (with signatures), Date
- 2 Pages for Executive Summary
- 15 Pages for Main Text (includes bibliography)
- 5 Pages for Appendices
- Page margins from "Normal" default template of MS Word
- Times New Roman 12 Point Font*
- 1.5 spacing*

- **REPORT DUE 12/06/05 AT 1400HRS**

* The Appendices may be in 10 point font single spaced
* Tables in the main text may be 10 point font, single spaced

SYS201 SUGGESTED PROJECT REPORT OUTLINE

i) TITLE PAGE
ii) TABLE OF CONTENTS
iii) EXECUTIVE SUMMARY
   a. What is the problem, why is it important
   b. What were you asked to do and by whom
   c. What did you do
   d. How did you do it – method, sources
   e. Summary of your results
   f. Your evaluation and recommendations

1. BACKGROUND
   a. Problem Description
   b. Why the problem is important
   c. What is being done
2. GOAL AND OBJECTIVES OF THE PROJECT
3. ALTERNATIVES
   a. Based on your research
      i. Null
      ii. Suggested alternative – if provided
      iii. Other alternative(s) you discovered in your research
      iv. Your proposed alternative(s)
4. EVALUATION CRITERIA
   a. Economic cost, economic benefits, sustainability, other
5. RANKING AND SELECTION OF ALTERNATIVE BY SERVICE
   a. Your procedure and outcomes
6. DISCUSSION
   a. Your evaluation of the results
   b. What recommendations would you make
7. CONCLUSION
   a. Quick review of what you were asked to do, what you did, how you did it, the results, the recommendations

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			SYS 201 - FALL 2004		
#	**Date**		**Topic**	**Project**	
1	25-Aug	H	Introductions, Syllabus, Logistics, Grading, Project	Describe Projects	L
2	30-Aug	T	What is Systems Engineering? Overview *K&M: 422-445, Gibson: 1-20*		S
3	1-Sep	H	History & Philosophy of Systems Engineering *K&M: 1-4, Haimes: pg. 13-17, Hilier & Lieberman: 1-5 (Toolkit)*		S
4	6-Sep	T	SE Approaches to Design & Problem Solving, Gibson Buede Chap 1, 1-36, K&M:4-12, Gibson: 29-53,91-95		L
5	8-Sep	H	SE Approaches to Design & Problem Solving, Systems Vee *Buede Chap 1, 1-36, K&M:4-12,*	Assign Teams	S
6	13-Sep	T	Objectives Trees and Requirements Analysis *K&M: 14-27, Gibson:55-86, Blanchard & Fabrycky Chapter 3 pg. 100-103, 126-132 (Toolkit)*		L
7	15-Sep	H	Evaluation, Ranking of Alternatives *K&M: 43-53, Gibson: 91-95,181-189*	Pick Topic	L
8	20-Sep	T	Sensitivity Analysis/ Selection *Clemen: 161-162 (Toolkit), Morgan & Henrion 172-183(Toolkit)*		L
9	22-Sep	H	EXAM 1		TA
10	27-Sep	T	Detailed Review of Project Requirements		L
11	29-Sep	H	Basic Statistics for SE: Concepts, Mean, Mode, Median, Histograms		S
12	4-Oct	T	Statistics in SE Problem Solving - Basic Regression	~~Lit Review~~	S
13	6-Oct	H	Mathematical Modeling Concepts, Taxonomy, Examples *K&M: 27-33, Haimes: 59-63 (Toolkit), Hilier & Lieberman: 7-21 (Toolkit)*		L
14	11-Oct	T	Intro to Linear Programming, *K&M: 323-327,293-294; Haimes: 64-74 (Toolkit), Hilier & Lieberman: 24-43 (Toolkit)*	Lit Review	S
15	13-Oct	H	Lagrangian, Calculus-based optimization CANCEL – Mid-semester evaluation *TBD*		L
16	18-Oct	T	Engineering Economics: Concept and Definitions *K&M: 36-43, Gibson: 95-110, Au&Au (Toolkit)*		S
17	20-Oct	H	Engineering Economics: Evaluating Competing Investments K&M: 43-57, *Au&Au (Toolkit)*		S
18	25-Oct	T	Engineering Economics: Cost Benefit Analysis K&M:62-66, *Au&Au (Toolkit)*	~~Interned Report~~	S
19	27-Oct	H	Engineering Economics: Cost Effectiveness Analysis *K&M:57-62,Boardman et. al.: 437-444*		L
20	1-Nov	T	EXAM 2	Inter Rept	TA
21	3-Nov	H	Decision Analysis: Decision Trees, Expected Value *Stokey & Zeckhauser: 201-211 (Toolkit), Clemen: 105-111, 219-223 (Toolkit)*		S
22	8-Nov	T	Decision Analysis: Decision Trees, Expected Value *K&M: 381-391*		S
23	10-Nov	H	Decisions. w. Multiple Objectives, HHM, Other Decision Rules *Stokey & Zeckhauser: 201-211 (Toolkit), Clemen: 105-111, 219-223 (Toolkit)* *Gibson: 194-224, Haimes: 93-100, 138-151, 183-191, 193-203*		L
24	15-Nov	T	Course Review *Class Notes*		L
25	17-Nov	H	EXAM 3,		TA
26	29-Nov	T	Project Presentations: 1 - 5	Pres 1-5	S
27	1-Dec	H	Project Presentations: 6 – 10	Pres 6-10	L
28	6-Dec	T	Project Presentations: 11 – 15, Final Report	Pres 11-15, Final Report	S

L – Louis S – Smith TA – Donohue T – Tuesday H – Thursday