Iowa State University
Department of Industrial and Manufacturing Systems Engineering
IE/AER E/ EE 565: Systems Engineering and Analysis
Spring 2017

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Meeting Times: TTh 11:00 a.m.–12:20 p.m.
HOWE 1324

Office Hours: TTh 1:30 p.m.–3:00 p.m.
or by appointment

Educational Objectives:

1. Develop an understanding of systems thinking and the phases of a system life cycle.
2. Understand the system engineer's role in developing complex systems.
3. Identify and describe systems engineering modeling and analysis tools.
4. Understand system requirements from the perspective of multiple stakeholders.

Learning Outcomes:

This course will provide knowledge that will support the successful development of students in the fields of Systems Engineering and Engineering Management in two broad areas:

- *Outcome 1*: Students will have knowledge of the core competencies necessary for effective engineering management and systems analysis and design.
- *Outcome 2*: Students will have knowledge of the necessary processes and tools and develop the skills to effectively manage both simple and complex systems and projects.

Outcome Assessment:

Assessment criteria for Outcome 1:
1. Four mini-projects will target student understanding of core competencies in Systems Engineering and Engineering Management.
2. Responses to final exam questions will demonstrate student knowledge of core competencies in Systems Engineering and Engineering Management.

Assessment criteria for Outcome 2:
1. Through the final project, students will perform research and identify the processes and tools that are necessary to manage the design and development of a system, and they will recommend and justify processes and tools that should be used to achieve desired outcomes.
2. Responses to final exam questions will demonstrate student knowledge of processes and tools required to manage systems and projects.

Prerequisites: Coursework in basic statistics

Textbook (required): *Decision Making in Systems Engineering and Management*, 2nd ed., Parnell, Driscoll, and Henderson, Wiley Publishing, ISBN 978-0-470-90042-0/

Grading: A weighted average grade will be calculated as follows:

Mini-Projects	40%
Midterm Exam	10%
Final Project	15%
Final Exam	25%
Participation	10%

The course grades will be determined as follows:

Score	≥93	92-87	86-83	82-77	76-73	72-67	67-63	62-60	<60
Grade	A	A- or B+	B	B- or C+	C	C- or D+	D	D-	F

If you fall into one of the "gray areas" (A- or B+, B- or C+, C- or D+), your grade will be determined by whether your performance has improved or remained constant (higher grade) or has gotten worse, especially on the final exam (lower grade), throughout the semester.

Projects: There are four mini-projects which will be assigned throughout the semester to give you the opportunity to apply the concepts and techniques that we have discussed in class. There will also be a final project, which will be due on the last day of class. All of the project assignments will be downloaded, completed, and submitted online. Each student will complete his/her own unique projects individually – these projects are not intended to be completed in groups.

Exams: The midterm and final exams can be taken in class or proctored for distance education students. The exams will be a mix of true/false, multiple choice, and short answer questions that check your basic knowledge and comprehension of the course materials. For the midterm exam, you will be allowed to use a calculator and **one** handwritten 8.5" x 11" sheet (front and back) of notes. For the final exam, you will be allowed to use a calculator and **two** handwritten 8.5" x 11" sheets (front and back) of notes. No photocopies or other electronically-generated note sheets will be allowed in either exam (i.e., your proctor will confiscate them before the exam). A make-up exam will be provided only if you miss the exam due to a verifiable emergency.

Participation: Your level of engagement will be monitored via the discussion board on the class website and will be assessed in terms of frequency of participation and quality of your contributions.

Re-grading Policy: If you feel that your performance has been under-evaluated, please resubmit your work, along with a written statement directly to the TA within three business days after receiving your grades, explaining clearly why you feel that your grade should be adjusted. The TA will re-grade your ENTIRE assignment/exam, which may possibly lower your grade.

Statement on Professionalism: The use of laptops, cell phones, smart phones, or other mobile communication devices is disruptive, and is therefore prohibited during class. Except in emergencies, those using such devices may be asked to leave the classroom for the remainder of the class period.

General: With the exception of the exams, all work will be submitted electronically through the class website. Please note that although this class may be offered in a distance education format it is not a self-paced course. Prior arrangements must be made for any scheduling conflicts; work may be submitted early to address schedule issues. Any assignment which is not submitted promptly by its due date and time will be assessed a penalty based on the formula $S = R \times e^{\frac{-t}{171}}$, where S is the score given, R is the score the work would have gotten if turned in on time, and t is the amount of time (in hours or fractions thereof) the work was late. However, **any assignment turned in more than 5 days (120 hours) late will automatically receive a zero**.

Statement on Academic Integrity: The IMSE Department has an expectation that all students will be honest in their actions and communications. Individuals suspected of committing academic dishonesty will be directed to the Dean of Students Office as per University policy. For more information regarding Academic Misconduct see:
http://www.dso.iastate.edu/ja/academic/misconduct.html

Statement on Disability Accommodations: Iowa State University is committed to assuring that all educational activities are free from discrimination and harassment based on disability status. All students requesting accommodations are required to meet with staff in Student Disability Resources (SDR) to establish eligibility. A Student Academic Accommodation Request (SAAR) form will be provided to eligible students. The provision of reasonable accommodations in this course will be arranged after timely delivery of the SAAR form to the instructor. Students are encouraged to deliver completed SAAR forms as early in the semester as possible. SDR, a unit in the Dean of Students Office, is located in room 1076, Student Services Building or online at www.dso.iastate.edu/dr/. Contact SDR by e-mail at disabilityresources@iastate.edu or by phone at 515-294-7220 for additional information.

Lesson Plan: Subject to change. In the event of a change, I will notify you in advance.

#	Date	Topics	Reference	Assignment Due
1	1/10	Course Overview; Introduction	pp. 1-21	
2	1/12	Systems Thinking	pp. 27-50, 54-59 An Overview of Systems Thinking	
3	1/17	System Life Cycle	pp. 65-90 Risk – Pinewood Derby	
4	1/19	Introduction to Systems Engineering; Systems Engineering in Professional Practice	pp. 185-193; pp. 197-224 Systems Engineering: Art & Science in an Int'l Context	
5	1/24	Requirements	NASA SE Handbook: Ch. 4; Ch. 6; Appendix C	
6	1/26	Functional Analysis	NASA SE Handbook: Ch. 4; Appendix F	
7	1/31	Synthesis	NASA SE Handbook: Ch. 4	Mini-Project #1
8	2/2	Verification, Validation, Evaluation	NASA SE Handbook: Ch. 5; Requirements Development, Verification, & Validation in Famous Failures	
9	2/7			
10	2/9	Systems Modeling & Analysis	pp. 95-131	
11	2/14	Systems Modeling & Analysis (cont'd)		
12	2/16	Probability Review		
13	2/21	Probability Review (cont'd)		
14	2/23	Hypothesis Testing		
15	2/28	System Reliability	pp. 227-228, 244-263	Mini-Project #2
16	3/2	ISU Library Basics; Exam Review		
17	3/7	**Midterm Exam**	**Section XE/XW: 3/7-3/13**	
18	3/9	Control Methods		
	3/14	Spring Break – no lecture		
	3/16	Spring Break – no lecture		
19	3/21	Linear Regression		
20	3/23	Life Cycle Costing	pp. 137-178; NASA SE Handbook: Ch. 6	
21	3/28	Life Cycle Costing (cont'd)		Mini-Project #3
22	3/30	Simulation Modeling & Analysis		
23	4/4	Complexity & Agent-Based Simulation Modeling	Seeing Around Corners	
24	4/6			
25	4/11	System Decision Process Overview; Problem Definition; Solution Design	pp. 275-390	
26	4/13	TBD		
27	4/18	Multi-Criteria Decision Making	pp. 395-432; Toward Wise Decision Making	
28	4/20	Decision Making Under Uncertainty	pp. 447-474	Mini-Project #4
29	4/25	Design for Usability		
30	4/27	Exam Review		Final Project
	5/2	**Final Exam: 9:45-11:45 a.m.**	**Section XE/XW: 4/28-5/5**	