608 – Industrial Case Study

Instructors

Professor Xinxin Hu
Email: hux@iemail.tamu.edu
Office Phone: 979-458-2371
Office: ETB 4021

Course Description

Overview: Business is a process by which inputs of materials, labor, capital, and information are transformed into products and services which customers want and are willing to pay for. How well can we understand, support, and possibly improve that process will be the single most important factor in our long-term professional success. In this course, we view any business as a process. Correspondingly, the concepts, principles, and techniques for managing the processes can be generalized and applied to improve the performance of business. We concentrate our attention on commonly used measures of process achievement such as throughput rate, flow time, inventory, utilization, efficiency, etc. By using the process flow method, we provide a framework for analyzing and solving a wide range of business problems.

Outlines: The course starts with the introduction on the strategic fit and efficiency ideas in process design. It follows with the discussion on how to evaluate and operate several representative types of processes – job shop, assembly line, continuous flow, and project. The second major topic in the course focuses on how to manage the more complex process which typically has variability in its operations. It includes the study on the impact of variability on the performance of the process, the guideline of managing the variability, the waiting line models, quality control analysis, and lean manufacturing. There will be plenty of cases discussed with each topic.

Course Materials

For most classes, sets of slides (including both handouts before the class and posts after the class) and reading materials can be downloaded. The course pack includes all the cases for you to exercise and discuss in the class. The case list is as follows:

1. “Kristen’s Cookie Company (A)” (HBS, 9-686-093)
3. “National Cranberry Cooperative” (HBS, 9-688-122)
4. “Toys City, Inc.”
5. “Manzana Insurance: Fruitvale Branch (Abridged)” (HBS, 9-688-122)
6. “Making Supply Meet Demand in an Uncertain World” (HBR, 94302)
7. “Delays at Logan Airport” (HBS, 9-102-011)
8. “Hank Kolb, Director, Quality Assurance” (HBS, 9-681-083)
10. “Sunwind AB” (IMD-6-0132 – European Case Clearing House)
11. “Donner” (HBS, 9-689-030)

HBS: Harvard Business School Cases
HBR: Harvard Business Review
and Richard B. Chase

**Grading**

The scores in this course are composed by the following items:

- **30% Individual Problem Exercises (6)**
  - Late submission is discounted with a rate of 20% per day
  - Submission is not accepted 5 days past the due time
- **40% Team Case Report (8)**
  - Late submission is not accepted
- **15% Midterm**
- **15% Final**

Final grades are translated from the scores according to the following scale:

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 ~ 100</td>
<td>A</td>
</tr>
<tr>
<td>80 ~ 90</td>
<td>B</td>
</tr>
<tr>
<td>70 ~ 80</td>
<td>C</td>
</tr>
<tr>
<td>60 ~ 70</td>
<td>D</td>
</tr>
<tr>
<td>Under 60</td>
<td>F</td>
</tr>
</tbody>
</table>

**Individual Problems Exercises:** This refers to a variety of activities that include (but aren't limited to) problem sets and essays.

**Team Case Report:** Students should make the case team with 3-4 members for addressing the eight team cases. Those cases will be fully discussed in the class after their submission. The due time is typically set as the starting of the corresponding case study class.
ISEN 609: Probability for Engineering Decisions  
SPRING 2013  
1027 ETB, TR 11:10am - 12:25pm

Instructor  
N. Gautam, 4012 ETB, 458-2345, gautam@tamu.edu

Office Hours  
TR 3:30-4:30pm

TA  
Ang Li, 2023 ETB, isela@tamu.edu Office Hours: MW 3:00-4:00pm.

Prerequisites  
An undergraduate course in probability for background material. Excellent skills in algebra, calculus and probability. Willing to learn to use mathematical software such as MATLAB.

Objective  
Develop tools and techniques based on probability theory that would aid in characterizing uncertainty in engineering decisions such as in optimal design (strategic decisions) and optimal control (operational decisions) of stochastic systems.

Text  
An Introduction to Stochastic Modeling, 4th ed. by Pinsky and Karlin

References  
- Modeling and Analysis of Stochastic Systems by V.G. Kulkarni  
- Introduction to Probability Models by S.M. Ross  
- Stochastic Processes By S.M. Ross  
- An Introduction to Stochastic Processes By Edward P.C. Kao  
- Discrete Stochastic Processes By R.G. Gallager

Homework  
Total of 10 homeworks; not collected; solutions would be given.

Quizzes  
Total of 10 quizzes, will drop 2 lowest; no make-ups for any reason whatsoever; in-class, closed-notes for 10-15 minutes; usually given on the class after homework solutions are handed.

Integrity  
Academic integrity is the pursuit of scholarly activity free from fraud and deception, and is the educational objective of this institution. Academic dishonesty includes, but is not limited to cheating, plagiarism, fabrication of information or citations, facilitating acts of academic dishonesty by others, unauthorized possession of examinations, submitting work of another person, or work previously used without informing the instructor, or tampering with the academic work of other students. Any violation of academic integrity will be thoroughly investigated, and dealt with severely according to the limits of the code. (Adapted from Prof. Ravindran’s syllabi)

Grading  
20% Quizzes (10 in-class quizzes, closed notes, drop 2)  
40% Midterm: Monday March 4th in 1027 ETB (6-8pm)  
40% Final: Friday May 3rd in 1027 ETB (3-5pm)

Note  
Do check your email often (at least once on the day of class or the night before class). Make sure you have forwarded your TAMU mails to a “reasonable” place. Go to http://e-learning.tamu.edu and sign in for course-related materials. In lieu of the night exam, two classes will be canceled (dates to be decided later). The topic outline and grading scheme are tentative and subject to change. Unless specifically instructed to do so by the instructor or TA, use of electronic devices such as computers, laptops, smart phones, tablets, etc. during class is prohibited.
Topic Outline (tentative)

1. Introduction to Probability (3 weeks)
   (a) Probability spaces and axioms of probability
   (b) Conditional probability, independence, and Bayes’ rule
   (c) Random variables, distributions and expectation operator
   (d) Computing expectation using sums and conditionals
   (e) Transforms and moment generating functions
   (f) Multivariate distributions: joint, marginal and conditional

2. Discrete time Markov chains (2 weeks)
   (a) Modeling
   (b) Transient and steady state analysis
   (c) Costs and rewards

3. Poisson processes (3 weeks)
   (a) Exponential distribution with properties
   (b) Poisson process with properties
   (c) Superposition and splitting of Poisson processes
   (d) Non-homogeneous and compound Poisson processes

4. Continuous time Markov chains (2 weeks)
   (a) Modeling
   (b) Transient and steady state analysis
   (c) Costs and rewards

5. Renewal processes (2 weeks)
   (a) Renewal theorems
   (b) Recurrence times
   (c) Renewal reward processes
   (d) Regenerative processes

6. Other stochastic processes (2 weeks)
   (a) Random walks
   (b) Brownian motion
   (c) Semi-Markov processes

7. Case studies (1 week)
Course Title: ISEN 613 Engineering Data Analysis (Fall 2014)

Meeting Times and Locations: 12:40 pm – 1:30 pm MWF, ETB 1005

Course Objectives and Prerequisites

This course provides an introductory, hands-on treatment of broad aspects of the emerging field of data analytics for engineers, with focus on statistical learning and predictive modeling methods. The course is designed mainly for master students pursuing professional degrees. The three objectives of the course are to:

(1) Learn the basic techniques of statistical learning and predictive modeling;
(2) Learn the principles of building and validating these modern statistical models for engineering applications;
(3) Demonstrate your knowledge of the techniques and principles by implement existing techniques or developing a novel technique in a real world problem, and conduct a comprehensive and insightful review study in any emerging area of statistical learning and data mining.

Basic knowledge in probability and statistical methods, and linear algebra is required. Prior programming experience is a plus.

Textbook

Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani. An Introduction to Statistical Learning with Applications in R, 1st Ed. Springer New York, 2013.

Instructor Information

Instructor: Satish Bukkapatnam (satish@tamu.edu)
Office: ETB 4046 (979-458-2348)
Office Hours: TBA
Teaching Assistant: TBA

Topics Covered (tentative, subject to changes)

<table>
<thead>
<tr>
<th>Content</th>
<th>Lab</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Engineering Data Analysis and Course Organization</td>
<td></td>
<td>Week 1</td>
</tr>
<tr>
<td>Module 1: Syllabus, Intro, Book keeping (Chapter 1)</td>
<td>Introduction to R</td>
<td></td>
</tr>
<tr>
<td>Review of Probability and Statistics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module 2: Probability concepts, discrete distributions</td>
<td>Probability calculation</td>
<td></td>
</tr>
<tr>
<td>Module 3: Continuous distributions and sampling theorems</td>
<td>Random sample generation; central limit theorem</td>
<td></td>
</tr>
<tr>
<td>Module 3: Confidence interval (CI), hypothesis testing I</td>
<td>CI generation, p-value, $\alpha$ and $\beta$</td>
<td></td>
</tr>
<tr>
<td>Module 4: Hypothesis testing II</td>
<td>Hypothesis testing methods for mean and variance</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overview of Statistical Learning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module 5: Statistical learning (Chapter 2)</td>
<td>Week 3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regression Analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module 6: Simple linear regression (Chapter 3)</td>
<td>Boston house price prediction</td>
<td></td>
</tr>
<tr>
<td>Modules 7&amp;8: Multiple linear regression (Chapter 3)</td>
<td>Ultra-precision machining (UPM) surface roughness prediction</td>
<td></td>
</tr>
<tr>
<td>Module 7: Multiple linear regression (Chapter 3)</td>
<td>Week 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model Validation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module 9: Residual analysis, Cross validation, Bootstrapping (Chapter 5)</td>
<td>Midterm 1</td>
<td></td>
</tr>
<tr>
<td>Modules 7&amp;8: Multiple linear regression (Chapter 3)</td>
<td>UPM regression analysis</td>
<td></td>
</tr>
<tr>
<td>Module 8: Residual analysis, Cross validation, Bootstrapping (Chapter 5)</td>
<td>Week 5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classification Analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module 10: Logistic regression (Chapter 4)</td>
<td>Stock Market data</td>
<td></td>
</tr>
<tr>
<td>Module 11: Linear discriminant analysis (Chapter 4)</td>
<td>Sleep apnea detection</td>
<td></td>
</tr>
<tr>
<td>Module 11: Linear discriminant analysis (Chapter 4)</td>
<td>Week 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced Regression and Classification Concepts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module 12: Model selection and regularization (Chapter 6)</td>
<td>Baseball player’s salary estimation (cross validation, ridge, lasso)</td>
<td></td>
</tr>
<tr>
<td>Module 13: Classification trees (Chapter 8)</td>
<td>Car seat sale classification</td>
<td></td>
</tr>
<tr>
<td>Module 14: Regression trees (Chapter 8)</td>
<td>Boston house price prediction</td>
<td></td>
</tr>
<tr>
<td>Module 14: Regression trees (Chapter 8)</td>
<td>Week 7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonlinear Regression</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module 15: Polynomial regression (Chapter 7)</td>
<td>Wage data prediction</td>
<td></td>
</tr>
<tr>
<td>Module 16: Local regression (Chapter 7)</td>
<td>Wage data prediction</td>
<td></td>
</tr>
<tr>
<td>Module 16: Local regression (Chapter 7)</td>
<td>Week 10</td>
<td></td>
</tr>
<tr>
<td>Module 17: Details of SVM classifier, SVM classifier for nonlinear boundaries (Chapter 9)</td>
<td>Sleep apnea detection</td>
<td>Week 11</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------</td>
<td>---------</td>
</tr>
<tr>
<td><strong>Module 18: SVM with more than two classes, comparison with logistic regression (Chapter 9)</strong></td>
<td>SVM with different kernels (linear, radial basis); gene expression data with 4 classes</td>
<td>Week 12</td>
</tr>
<tr>
<td><strong>Unsupervised Learning</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Module 19: Principal component analysis (Chapter 10)</strong></td>
<td>PCA and factor analysis; UPM feature extraction, dimension reduction using PCA</td>
<td>Week 13</td>
</tr>
<tr>
<td><strong>Module 20: Clustering (Chapter 10, k-means clustering, hierarchical clustering)</strong></td>
<td>Gene expression data clustering; <em>Pre finals</em></td>
<td>Week 14</td>
</tr>
</tbody>
</table>

**Grading Policy**

**Grading Scale:** A = 90-100%, B = 80-90%, C = 70-80%, D = 60-70%, F = below 60%

**Grading Weight:** Attendance (10%), Homework (20%), Quiz (10%), Midterm (20%), Final (40%)

**Americans with Disabilities Act (ADA)**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information please visit: http://disability.tamu.edu

**Academic Integrity**

For additional information please visit: http://aggiehonor.tamu.edu

“An Aggie does not lie, cheat, or steal, or tolerate those who do.”
ISEN 614 Advanced Quality Control

General Information
Instructor: Dr. Yu Ding, Office: 4016 ETED
Phone: 458-2343
Email: yuding@iemail.tamu.edu (NOT yuding@tamu.edu)

Textbook: None. Class notes will be posted on the course website.

Reference Books


Useful software: Excel, MATLAB and R (freeware).

Description of Course: Fundamental methods about anomaly and change detection in a process or an environment. Methods covered include statistical background, sampling distribution, confidence interval, hypothesis testing, univariate and multivariate analysis for continuous and discrete data, risk adjustments, data pre-analyses (such as dimension reduction). Methods of anomaly and change detection find themselves in a broad spectrum of applications, including manufacturing quality control, healthcare and bio surveillance.

This course is designed for master's students in the engineering and statistics fields to learn about the basic concepts and practical tools for performing quality control and anomaly and change detections. It will help doctoral students in both fields broaden their knowledge base and get exposed to new applications. But theoretical analysis is NOT the focus of this course.

Topic breakdown
1. Basic mathematical setup and relation to six-sigma programs
2. Sampling properties and distributions
3. Statistical inference (confidence intervals and hypothesis testing)
4. Type-I and type-II error
5. Univariate analysis: Shewhart control chart, CUSUM and EWMA
6. Univariate analysis: control chart for attribute (discrete) data
7. Univariate analysis: risk adjustments
8. Multivariate statistics
9. Multivariate control charts: $T^2$, multivariate EWMA and CUSUM
10. Principal components analysis and data reduction
11. Multivariate methods for discrete data
12. Applications (quality control, healthcare, security applications)

Preferred Background
1. Linear Algebra or Matrix Algebra
2. Knowledge on hypothesis test and linear regression (ISEN 314 or equivalent).
Course Syllabus

Credits: 3/0
Class Hours: MW 4:10 pm – 5:25 pm
Classroom: ETB 1006

Instructor: Sergiy Butenko
Office: 4037 ETED
e-mail: butenko@tamu.edu
Phone: 458-2333
Office Hours: Tu 9:00-11:00 or by appointment

Course Description

This is an introductory course discussing theory and numerical methods for deterministic linear and nonlinear optimization. Topics to be discussed include linear programming, unconstrained and constrained nonlinear optimization, including classical optimality conditions and numerical algorithms.

Text: There is no required text, however, it is recommended to have at least one reference text covering linear and nonlinear optimization, such as Numerical Methods and Optimization: An Introduction by Butenko and Pardalos, ISBN: 978-1466577770 or Linear and Nonlinear Optimization by Griva, Nash and Sofer, ISBN 978-0-898716-61-0.


Prerequisite: MATH 304 or MATH 311.

Announcements: The course website will be maintained through http://ecampus.tamu.edu/. This site will contain announcements and other information concerning the course. In addition, it will be used to distribute class materials (homework assignments, notes), grades and to facilitate communication between the instructor and students (discussion and chat sections). Please check the web site daily – any information posted on it will be as valid as if it was mentioned in class. You will need to use your TAMU NetId to log in.

Assumed Skills: Basic Excel and manipulation of spreadsheets. A word processor of your choice (e.g., MS Word or \LaTeX) for written reports and other assignments.
Computer Accounts: The Industrial Engineering Department maintains an undergraduate computer lab that has virtual 24 hours access, 7 days a week. In order to use this facility, students are expected to establish their accounts within the first week of the course. The lab help desk is located at ETB 3005A.

Topics:

- Linear programming fundamentals
- Revised simplex and other algorithms
- Duality and sensitivity analysis
- Unconstrained optimality conditions
- Constrained optimality conditions
- Convex programming theory
- Numerical algorithms

Grading:

- Four Exams (tentatively on 9/22, 10/15, 11/10, and 12/3) – 25% each. Up to 10 ungraded homework assignments will be given; solutions will be provided.

Final grades will be assigned as follows: 90-100% A, 80-90% B, 70-80% C, 60-70% D, < 60% F.

Missed tests: If a test is missed, the student must present a written authorized excuse no later than 24 hours after the exam in order to take a make-up.

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities in Room 126 of the Koldus Building, or call 845-1637.

Academic Integrity: “Aggies do not lie, cheat, or steal, nor do they tolerate those who do.” It is the responsibility of students and instructors to help maintain scholastic integrity at the university by refusing to participate in or tolerate scholastic dishonesty. (http://www.tamu.edu/aggiehonor)
Course title and number: ISEN 625 Simulation Modeling and Applications
Term: Fall 2014
Meeting times and location: MW 9:10 AM – 10:00 AM
Lab W 11:30 AM – 2:00 PM
class and lab meetings are in 1027 ETB

Course Description and Prerequisites

Fundamental methodologies of simulation modeling; random number and variate generation, statistical analysis of model output, and discrete event modeling using a commercial simulation language.

Prerequisites: STAT 601 or STAT 630 (or STAT 211 and STAT 212) and knowledge of Excel.

Course Objectives

The objectives are to understand the following:
1. Understand the fundamental methodologies of discrete event (process-oriented) simulation modeling,
2. Understand the key statistical issues involved in simulation data preparation and the analysis of simulation output, and
3. Become familiar with modeling using a commercial language (Simio).

Instructor Information

Name: Andy Banerjee
Telephone number: 979-458-2341
Email address: banerjee@tamu.edu
Office hours: T 1:30 – 3:30; W 2:30 – 3:30; or by appointment
Office location: 4041 ETB

Teaching Assistant

Name: TBA
Email address: TBA
Office hours: TBA
Office location: TBA

Textbook and/or Resource Material

Course Topics, Calendar of Activities, Test schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics / Test Schedule (in red)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to simulation and modeling; relationship with probability and statistics. Introduction to Simio.</td>
</tr>
<tr>
<td>2</td>
<td>Modeling concepts. Structure of Simio.</td>
</tr>
<tr>
<td>5</td>
<td>Statistical analysis of output. Modeling and analysis using Simio.</td>
</tr>
<tr>
<td>6</td>
<td>Comparison of systems. Modeling and analysis using Simio. First in-class exam</td>
</tr>
<tr>
<td>7</td>
<td>Comparison of systems. First lab exam.</td>
</tr>
<tr>
<td>11</td>
<td>Verification and Validation. Modeling and analysis using Simio.</td>
</tr>
<tr>
<td>13</td>
<td>Tests for random numbers and random variates. Modeling and analysis using Simio.</td>
</tr>
<tr>
<td>14</td>
<td>Variance Reduction Techniques and other advanced topics. Second lab exam.</td>
</tr>
<tr>
<td>15</td>
<td>Review</td>
</tr>
</tbody>
</table>

Grading Policies

Exams and Grading:

<table>
<thead>
<tr>
<th>Exam Type</th>
<th>Date</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>In class exam 1</td>
<td>Monday, October 6</td>
<td>[probability and statistics – self-study]</td>
</tr>
<tr>
<td>In class exam 2</td>
<td>Monday, November 24</td>
<td>[concepts and theory covered in lectures]</td>
</tr>
<tr>
<td>In lab exam 1</td>
<td>Wednesday, October 15</td>
<td>[modeling and analysis skills]</td>
</tr>
<tr>
<td>In lab exam 2</td>
<td>Wednesday, December 3</td>
<td>[modeling and analysis skills]</td>
</tr>
<tr>
<td>Final exam</td>
<td>Monday, December 15</td>
<td>8:00 a.m. – 10:00 a.m. – according to university final exam schedule.</td>
</tr>
</tbody>
</table>

Without the final, in class exams are 17% and in lab exams are 23% each. Quizzes based on homework and topics covered in class (8%). Homework will not be graded. Lab Assignments (12%)

Grades: A: 100% – 90%, B: 89.9% – 80%, C: 79.9% – 70%, D: 69.9% – 60%, F: less than 60%.

With an excused absence, it is still the student's responsibility to find out the homework assignment and be ready for a quiz. **Missing an exam without a written authorized excuse will result in 0 grade.** If possible, please let me know before the test; otherwise, I must be notified within two days of your return to school. Any disagreements regarding a grade received on any graded material must be discussed within one week of the return of the graded material. **No grade will be changed beyond the one week limit.**

DL students will work the course instructor to schedule the exam within a week of the scheduled exam date for the in class students.

Grades will be maintained online at [http://ecampus.tamu.edu](http://ecampus.tamu.edu).

Class Attendance: Class attendance is not optional. You are expected to attend all class lectures and labs except for university excused absences. **With an excused absence, it is still the student's responsibility to find out the homework assignment and be ready for a quiz.** The university rule regarding excused absences can be found at [http://student-rules.tamu.edu/rule07](http://student-rules.tamu.edu/rule07). Because we often begin class or labs with computer work, it is also important that you arrive on time. **Students arriving to lab after the initial lab...**
lecture has started will receive a two point deduction for that day’s lab assignment.

Online content for the course will be made available for the DL students as the course progresses during the semester. The weekly lab modules will be made available with the required resources for the DL students. The lab assignment will be due by 5:00 PM the following Sunday.

**Quizzes, Homework, and Lab:** At any time, without warning, a short quiz based on the homework or in-class examples might be given. Quizzes are 5-10 points and labs are 10 points, although some of the more complex lab assignments may be split into an in-class portion and a take-home portion. Simulation code developed as part of the lab assignment should be submitted online using [http://ecampus.tamu.edu](http://ecampus.tamu.edu). Take-home lab assignments will always be due by 5:00 PM on the Friday following the lab, and should be submitted online using [http://ecampus.tamu.edu](http://ecampus.tamu.edu). **Late assignments are not accepted.** Quizzes will be given at the start of class so it is important not to be late since late arrivals will receive zero for that day’s quiz. Homework will not be graded but you must do the homework, when given, to learn the material.

The quiz will be made available for the DL students on ecampus.tamu.edu.

**Classroom Computers:** During lectures, the monitor in front of you should be turned off unless you have been asked to use the computers as part of the lecture.

**Cell Phone Use:** If you use your cell phone during lectures, you may be asked to leave the room. This includes texting on your phone. Use of your cell phone, including texting, during a test will automatically be considered an act of academic dishonesty unless I am notified ahead of time of special circumstances.

**Copyright Notice:** The handouts used in this course are copyrighted. By "handouts," I mean all materials generated for this class, which include but are not limited to syllabi, exams, lab problems, in-class materials, review sheets, web pages, and additional problem sets. Because these materials are copyrighted, you do not have the right to copy the handouts, unless I expressly grant permission.

**Americans with Disabilities Act (ADA)**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit [http://disability.tamu.edu](http://disability.tamu.edu)

**Academic Integrity**

For additional information please visit: [http://aggiehonor.tamu.edu](http://aggiehonor.tamu.edu)

"An Aggie does not lie, cheat, or steal, or tolerate those who do." It is the responsibility of students and instructors to help maintain scholastic integrity at the university by refusing to participate in or tolerate scholastic dishonesty.

It is acceptable for you to discuss both lab assignments and homework with colleagues; it is also permissible to show another student your code (except during tests) as long as you DO NOT COPY each other's work. After discussing an assignment with someone else, do not write anything that you do not understand and always use your own language on the assignments. Obviously, you may not discuss exams with anyone else until after the exam is over and you know that every student you are discussing the exam with has already taken it. No leniency is given for academic dishonesty during a test. A report will be made to the Aggie Honors Office regarding academic dishonesty during a test with a recommended course grade of F*.
Other Pertinent Course Information

**Software:** We will be using Simio as the simulation software, and Arena’s Input Analyzer and @RISK Excel add-in for input data analysis. The software is available on the departmental cloud server ([https://isegoapps.tamu.edu](https://isegoapps.tamu.edu)) and also in the computers in the lab and classrooms. Information on obtaining an optional personal copy of Simio will be made available on eCampus.
ISEN 630: Human Operator in Complex Systems  
Spring 2014

Course Info: 12:45 – 2:00 PM, Tuesdays and Thursdays  
1006 ETB

Instructor: Thomas Ferris, PhD  
4081 ETB  
tferris@tamu.edu, 979-458-2340  
Office Hours: 3:45 – 5:00 Tuesday, or by appointment

Text: An Introduction to Human Factors Engineering, Second Edition  
Pearson Education, Inc.  
* 1st edition is an acceptable substitute *

Other materials will be hosted on eCampus: http://eCampus.tamu.edu/  
Lectures will be recorded and hosted on eCampus->Content->Lecture videos, usually within 48 hours

Scope and Objectives: This graduate course is a survey of cognitive and physical ergonomics, covering topics of human information processing, physiological and biomechanical functioning, and implications for design of the workplace and jobs in that workplace. The field of Human Factors and Ergonomics (HFE) is interdisciplinary, with applications wherever humans interact with equipment in a system context. Examples will be drawn from manufacturing, medicine, aerospace, ground transportation, and computer interaction. Students will learn an overview of HFE principles and understand how they fit into engineering design and analysis. Typical design and operational problems in work domains, as well as their HFE solutions, will be highlighted. Students will apply HFE principles to design problems and a research project will allow them to explore in depth a relevant HFE topic of interest.

Grade Determination:  
25% Homework  
55% Exams: midterm (25%) and final exam (30%)  
20% Research report

Grades will be calculated on the basis of total points earned. The points can be curved based on class average and may be lower than the following standard (out of a total of 100 points).

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90-100</td>
</tr>
<tr>
<td>B</td>
<td>80-89</td>
</tr>
<tr>
<td>C</td>
<td>70-79</td>
</tr>
<tr>
<td>D</td>
<td>60-69</td>
</tr>
<tr>
<td>F</td>
<td>59 and lower</td>
</tr>
</tbody>
</table>
Homework:
There will be approximately one homework assignment given each week, related to the current lecture topics and designed to give you practice in applying principles and ideas learned in the course. The planned homework assignments listed in the schedule below are tentative and subject to change. Assignments will be posted on eCampus and announced in lecture and/or via email. Due dates for each assignment will be given when they are issued, but will generally be within 1 week. Completed assignments can be submitted in class, or electronically via eCampus (in pdf or Word format). Total homework grade will be based on total points, not on the average of percentage grades for each homework assignment.

Generally, assignments that are submitted after the due date/time will not receive any credit. Exceptions can be made in case of sickness, military service, jury duty, presentation at a professional conference, or death in the family. In all of these cases, some form of documentation will be required.

Exams:
There will be two exams, a midterm worth 25% of the overall course grade and a final exam worth 30% (50% total). Each exam will follow an open-book, “take home” format, with rigid timelines for completion. Collaboration on exams is not allowed and may result in offending parties receiving no credit on the exam. The exams will are tentatively scheduled to be issued the week before Spring Break and at the end of the semester. The exams will emphasize material discussed in lecture, but will also include questions from the texts and assigned readings. Each exam will have a mixed format, which can include quantitative problems, short answer questions, and/or essays. Grades will be posted on the course eCampus website within 1 week, and students can review their graded exams during office hours. Exam submission dates will be flexible only in case of sickness, military service, jury duty, presentation at a professional conference, or death in the family (documentation required in all cases).

Re-grading Policy:
Students have 1 week after grades are released for an assignment or exam to submit a re-grade request in writing. This request must not exceed 1 page (11 point font, single spacing), and must clearly indicate the relevant problem(s) and justification for why you think re-grading is warranted. Note that a requested re-grade may result in further point deductions if new errors are discovered.

Research report:
Each student will work individually to prepare an in-depth research paper (~10 pages of 1.5-spaced text plus figures, 10+ references cited) on some topic relevant to the course, due at the end of the semester. A research report proposal will be due after the 4th week of class, so that I can judge the relevance and depth of the topic and provide advice/guidance. Further details on this report will be given early in the semester.

Americans with Disabilities Act (ADA)
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for
reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 979-845-1637. For additional information, visit http://disability.tamu.edu.

I also encourage you to discuss your situation with me in confidence so that I can better assist you in accomplishing your academic goals in this class. DL students with disabilities should email or telephone me to discuss any special accommodations that they will need. Such conversations will be held in strict confidence.

**Academic Integrity**

"An Aggie does not lie, cheat, or steal, or tolerate those who do."

For additional information please visit: http://www.tamu.edu/aggiehonor

**Lecture Topics and Tentative Schedule (Subject to Change!)**

Changes will be announced in class/via email and an updated schedule will be available on eCampus. Note: homework, exam, and research report due dates will be given when each is issued.

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Lecture title</th>
<th>Tentative topics</th>
<th>Text/source material and references</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>14-Jan</td>
<td>0</td>
<td>Course Introduction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16-Jan</td>
<td>1</td>
<td>Introduction to HFE</td>
<td>Definitions and scope, general guidelines</td>
<td>Wickens, Ch. 1; eCampus: MIL-HDBK-1908B (definitions)</td>
<td>Bio</td>
</tr>
<tr>
<td>21-Jan</td>
<td>2</td>
<td>Vision</td>
<td>Optics, physiology, perception, visual acuity, refractive error</td>
<td>Wickens, Ch. 4; eCampus: Vision, Optical Constants, Corrective Lenses, Color Blindness</td>
<td></td>
</tr>
<tr>
<td>23-Jan</td>
<td>Vision (continued)</td>
<td>Contrasts, adaptation, color vision, color-anomalous vision</td>
<td></td>
<td>Homework 1</td>
<td></td>
</tr>
<tr>
<td>28-Jan</td>
<td>Vision (continued)</td>
<td>Size and depth cues, bottom-up and top-down influences in perception</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-Jan</td>
<td>3</td>
<td>Illumination in the workplace</td>
<td>Physics of light, photometry, Lambert's Law, illumination guidelines</td>
<td>Wickens, Ch. 4; eCampus: Photometry, Light measurement</td>
<td>Homework 2</td>
</tr>
<tr>
<td>4-Feb</td>
<td>4</td>
<td>Displays</td>
<td>Types of displays, display design principles</td>
<td>Wickens, Ch. 8; eCampus: MIL-HDBK-759C 5.2, 5.3, 5.5</td>
<td>Research report proposal</td>
</tr>
<tr>
<td>Date</td>
<td>Topic</td>
<td>Material</td>
<td>Homework</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>----------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-Feb</td>
<td>Displays (continued)</td>
<td>Usage guidelines, classifications of visual displays, layout, graphical data, advanced displays</td>
<td>Homework 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-Feb</td>
<td>5 Warnings</td>
<td>When, where to use warnings, types of warnings</td>
<td>Wickens, Ch. 14 (Risk-Taking and Warnings); eCampus: MIL-HDBK-759C 5.3, 5.5; MIL-STD-1472F 5.13.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-Feb</td>
<td>Warnings (continued)</td>
<td>Criteria for effective warnings, warning design</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-Feb</td>
<td>6 Hearing and noise</td>
<td>Psychoacoustics, physics of sound propagation, sensation and perception of sound</td>
<td>Wickens, Ch. 5; eCampus: Sound measurement, Hearing Conservation, Hearing Loss (to pg. 10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-Feb</td>
<td>Hearing and noise (continued)</td>
<td>Noise limits and hearing protection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25-Feb</td>
<td>7 Controls and dynamics</td>
<td>Control types and usage, guidelines for design of controls</td>
<td>Wickens, Ch. 9; eCampus: Reaction Time, Human Performance (3.2, 3.3), Movement Time, MIL-HDBK-759C 5.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27-Feb</td>
<td>Controls and dynamics (continued)</td>
<td>Modeling of perception-reaction time, movement time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-Mar</td>
<td>8 Attention, memory, and workload</td>
<td>Varieties of attention, timesharing and multitasking</td>
<td>Wickens, Ch. 6, Ch. 13; eCampus: Information Theory, Mental Workload, Cognitive Resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-Mar</td>
<td>Attention, memory, and workload (continued)</td>
<td>Types of memory, use of mnemonics, job aids, information design, mental workload</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-Mar</td>
<td>SPRING BREAK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-Mar</td>
<td>SPRING BREAK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>No.</td>
<td>Topic</td>
<td>Description</td>
<td>Reading Material</td>
<td>Assignment</td>
</tr>
<tr>
<td>------------</td>
<td>-----</td>
<td>-------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>18-Mar</td>
<td>9</td>
<td>Human error</td>
<td>Reason's model of human error, error mitigation</td>
<td>Wickens, Ch. 14; eCampus: Human Error</td>
<td>Homework 8</td>
</tr>
<tr>
<td>20-Mar</td>
<td>10</td>
<td>Anthropometry</td>
<td>Human body dimensions, range of movement, design aspects</td>
<td>Wickens, Ch. 10; eCampus: MIL-BDBK-759C 5.6</td>
<td></td>
</tr>
<tr>
<td>25-Mar</td>
<td>11</td>
<td>Work station design</td>
<td>Applications of anthropometry, basic principles, equipment</td>
<td>Wickens, Ch. 10</td>
<td>Homework 9</td>
</tr>
<tr>
<td>27-Mar</td>
<td>12</td>
<td>Work study</td>
<td>Overview of work study, operational sequence diagrams</td>
<td>eCampus: Work study materials</td>
<td></td>
</tr>
<tr>
<td>1-Apr</td>
<td>13</td>
<td>Work Physiology</td>
<td>Physiology of work, physical work measurement, limits</td>
<td>Wickens, Ch. 11 &amp; 12</td>
<td>Homework 10</td>
</tr>
<tr>
<td>3-Apr</td>
<td>14</td>
<td>Manual material handling</td>
<td>General guidelines and mitigants, application of military</td>
<td>Wickens, Ch. 11 &amp; 12; eCampus: NIOSH Lift Guide, Material Handling</td>
<td></td>
</tr>
<tr>
<td>8-Apr</td>
<td>15</td>
<td>Manual material handling (continued)</td>
<td>Industrial, government standards, esp. NIOSH Lifting Guide</td>
<td></td>
<td>Homework 11</td>
</tr>
<tr>
<td>10-Apr</td>
<td>16</td>
<td>Cumulative Trauma Disorders</td>
<td>Description of CTDs, their mitigants, and tool selection</td>
<td>Wickens, Ch. 11; eCampus: Elements of Ergonomics Programs (toolbox)</td>
<td></td>
</tr>
<tr>
<td>15-Apr</td>
<td>17</td>
<td>Environmental stressors</td>
<td>Physiology of heat and cold tolerance, clothing, and guides</td>
<td>eCampus: Heat Stress, Cold Stress, MIL-STD-759C 5.8</td>
<td>Homework 12</td>
</tr>
<tr>
<td>17-Apr</td>
<td>18</td>
<td>Scheduling and shift design</td>
<td>Fixed and rotating 2 and 3-shift schedules, sleep disruption and circadian rhythms</td>
<td>Wickens, Ch. 13; eCampus: Kodak Shift Schedules</td>
<td></td>
</tr>
<tr>
<td>22-Apr</td>
<td>19</td>
<td>Social factors and teams</td>
<td>Work groups, teams, communication factors</td>
<td>Wickens, Ch. 19</td>
<td>Research report</td>
</tr>
<tr>
<td>24-Apr</td>
<td>19</td>
<td>HF&amp;CS research</td>
<td>TBD</td>
<td></td>
<td>Final exam: Topics 9-18</td>
</tr>
</tbody>
</table>
ISEN 689: Special Topics in Cognitive Systems Engineering
Fall 2013

Lectures: 2:20 – 3:35, Tuesdays and Thursdays
1013 ETB

Instructor: Thomas Ferris, PhD
4081 ETB
tferris@tamu.edu (preferred), 979-458-2340
Office Hours: 3:45 – 5:00 Tuesdays, or by request

Text: All course readings will be posted on the course eCampus site:
http://ecampus.tamu.edu/

Scope and Objectives:
This course will provide an overview of the fields of Cognitive Systems Engineering (CSE) and Cognitive Ergonomics (CE), which are concerned with studying the role of humans in sociotechnical engineered systems and designing processes, tools, and technologies to support cognitive functions such as communication, planning, decision-making, and problem-solving in complex work domains. It will analyze how artifacts, displays, social interactions, and factors such as stress, time pressure, competing demands, and uncertainty affect performance in cognitive systems. Examples of ongoing CSE and CE research will be discussed. Analysis and design methods will be presented and applied to a group project throughout the semester.

Grade Determination:
25% Reading responses
50% Exams: midterm (25%) and final exam (25%)
25% Semester project

Grades will be calculated on the basis of total points earned. If deemed necessary, the grade thresholds may be shifted to be lower than the following standard (out of a total of 100 points).

A  90-100
B  80-89
C  70-79
D  60-69
F  59 and lower
Reading Responses:

With few exceptions, there will be an assigned reading related to the lecture material for each class. The readings will be posted on eCampus. As a way to jump-start class discussion, you will need to submit a reading response for each assigned reading via eCampus by 12:00 noon on the day of the associated lecture, unless otherwise specified. These responses must be one page in length (strictly enforced; 11 point font, single spacing) and must include:

1) A summary of the reading, in your own words (anything copied verbatim from text or other sources will result in no credit given for the response, and potentially an honor system violation)

2) Clearly separated from the summary, at least one of the following:
   A) An insightful question about the reading. Time permitting, I will address as many of these questions as I can in lecture.
   B) A comment about how the reading relates to other course concepts or to an example/anecdote from your own life experience.

The reading response exercises are designed to support assimilation and retention of the course material, and also to identify emphases for me to cover in lecture. With apologies, there won’t be time to address everyone’s questions during the lecture period, but please be prepared to expand on your comment or question in lecture.

Generally, late submissions for reading responses will not receive any credit. Exceptions can be made in case of sickness, military service, jury duty, presentation at a professional conference, or family emergencies. In all of these cases, some form of documentation will be required.

Exams:

There will be two written exams: a midterm which is tentatively scheduled for October 10th, and a comprehensive final exam on December 11th, each of which account for 25% of your final grade. The exams are closed-book and will emphasize material discussed in lecture, but can also include any material from the assigned readings. Each exam will consist primarily of short answer essay questions. Make-up exams will be offered only in case of sickness, military service, jury duty, presentation at a professional conference, or family emergency (documentation required in all cases).

Re-grading Policy:

Students have 1 week after grades are released for an assignment or exam to submit a re-grade request in writing. This request must not exceed 1 page (11 point font, single spacing), and must clearly indicate the relevant problem(s) and justification for why you think re-grading is warranted. Note that a requested re-grade may result in further point deductions if new errors are discovered.

Semester Project:

Teams of 2 - 4 students (formed by the instructor) will collaborate on a project analyzing the cognitive work performed in a sociotechnical system of their choice. This project will take part in 3 phases, each with its own deliverables. Note that the 3-phase plan below is tentative and may change
due to the availability of resources. Changes in the plan could also lead to redistribution of project grade percentages for each deliverable.

- Phase 1: Students will define the sociotechnical system of interest for this project and perform a front end analysis on that system. This will serve to inform the \textit{in situ} data collection and guide the task analysis in Phase 2.
  - Deliverable: Front end analysis report (30\% of project grade)

- Phase 2: Students will apply task analysis techniques to formally describe system tasks/functions that were selected for the project focus. In addition to a task analysis description, the report deliverable will include identification of subtasks that are problematic or could likely be improved with different technology, training, or procedures.
  - Deliverable: Task analysis description and report (30\% of project grade)

- Phase 3: Students will design a “solution” to improve the effectiveness of the analyzed system according to shortcomings that were identified in Phase 2. This solution may take several forms, for example, it may involve the development of technology to aid humans in the system (e.g., software tool, external memory aid, information visualization), a procedural change, or a training method. An additional requirement may be for the solution to be evaluated using techniques discussed in class (e.g., usability study, focus groups/interviews/surveys, mini-experiments). Project groups will work with Dr. Ferris to determine the appropriate scope for this activity.
  - Deliverables: Solution and evaluation report (30\% of project grade), in-class presentation (10\% of project grade)

Each team member is expected to contribute to each phase of the project and each deliverable. Students will be required to submit peer evaluation forms for the members of their team, and individual grades will be adjusted up/down based on the combined evaluation forms from all team members. Students are strongly encouraged to contact Dr. Ferris early on if there are any problems with/between team members that require attention.

\textbf{Distance Learning:}

There is a distance learning (DL) section for this class. The assignments, exams, and general expectations will be the same for DL students as they are for the local section. Each lecture will be captured on video and uploaded within 48 hours to eCampus. These videos will be available for both DL and local students. Questions/reporting technical issues with the video can be directed to ISEN Senior Information Technology Professional Mark Hopcus (mhopcus@tamu.edu). Anything announced in lecture that is time-sensitive will also be relayed to DL students via email. I will follow up with the DL students individually to coordinate activities that would normally need to be conducted in person, such as exams and final project presentations.

\textbf{Americans with Disabilities Act (ADA)}

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation
requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 979-845-1637. For additional information visit http://disability.tamu.edu

**Academic Integrity**

*”An Aggie does not lie, cheat, or steal, or tolerate those who do.”*

For additional information please visit: http://www.tamu.edu/aggiehonor

**Lecture Topics and Tentative Schedule (Subject to Change!)**

Changes will be announced in class/via email. Required readings for Reading Responses (RR’s) will be posted on eCampus a few days in advance of the due date and the selected readings are likely to differ at times from the list in the schedule below. **Note: RR’s must be submitted by 12:00 noon on the day of the associated lecture.**

<table>
<thead>
<tr>
<th>Date</th>
<th>Lecture Topic</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>27-Aug</td>
<td>Course introduction, human-centered design</td>
<td>Read Norman, 1986 (no RR required, but know the reading material for exams)</td>
</tr>
<tr>
<td>3-Sep</td>
<td>Humans and sociotechnical systems</td>
<td>RR2: Wilson, 2013</td>
</tr>
<tr>
<td>5-Sep</td>
<td>Intro to analysis and design methods</td>
<td>RR3: Wickens et al., 2004 (Ch. 3)</td>
</tr>
<tr>
<td>10-Sep</td>
<td>Case study: NICU incubator design</td>
<td>RR4: Ferris &amp; Shepley, 2013</td>
</tr>
<tr>
<td>17-Sep</td>
<td>Human error: models and classification</td>
<td>RR6: Reason, 1990 (Ch. 3)</td>
</tr>
<tr>
<td>19-Sep</td>
<td>Design-induced error and error management</td>
<td>RR7: Reason, 1990 (Ch. 7); Project proposal due</td>
</tr>
<tr>
<td>24-Sep</td>
<td>Cognitive Task Analysis</td>
<td>RR8: Bisantz &amp; Roth, 2007</td>
</tr>
<tr>
<td>26-Sep</td>
<td>TBD/slack...</td>
<td>RR9: TBD</td>
</tr>
<tr>
<td>1-Oct</td>
<td>TBD (HFES conference)</td>
<td>TBD</td>
</tr>
<tr>
<td>3-Oct</td>
<td>TBD (HFES conference)</td>
<td>TBD</td>
</tr>
<tr>
<td>8-Oct</td>
<td>Midterm review: Concept mapping</td>
<td>Review the concept mapping material; Project phase 1 deliverable due</td>
</tr>
<tr>
<td>10-Oct</td>
<td>Midterm</td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>Topic</td>
<td>Reading Material</td>
</tr>
<tr>
<td>----------</td>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>15-Oct</td>
<td>Human-automation interaction part 1: models and key concepts</td>
<td>RR10: Wickens et al., 2004 (Ch. 16)</td>
</tr>
<tr>
<td>17-Oct</td>
<td>Human-automation interaction part 2: Breakdowns and ironies of automation</td>
<td>RR11: Ferris et al., 2010</td>
</tr>
<tr>
<td>22-Oct</td>
<td>Bridging the Gulfs of Execution and Evaluation: the Power of Representation</td>
<td>RR12: Norman, 1993 (Ch. 3)</td>
</tr>
<tr>
<td>24-Oct</td>
<td>Display/interface principles and usability</td>
<td>RR13: Wickens, 2004; Chapter 8</td>
</tr>
<tr>
<td>29-Oct</td>
<td>Ecological Interface Design</td>
<td>RR14: Vicente, 2002</td>
</tr>
<tr>
<td>5-Nov</td>
<td>Display/interface design to support attention and task management/multitasking</td>
<td>RR16: Ferris &amp; Sarter, 2011; Project phase 2 deliverable due</td>
</tr>
<tr>
<td>7-Nov</td>
<td>Decision Making: models and human tendencies</td>
<td>RR17: Wickens et al., 2004 (Ch. 7)</td>
</tr>
<tr>
<td>12-Nov</td>
<td>DM continued, Decision Support Systems</td>
<td>RR18: Mosier &amp; Fischer, 2010</td>
</tr>
<tr>
<td>14-Nov</td>
<td>Emotion and Stress factors</td>
<td>RR19: Eccles et al., 2011</td>
</tr>
<tr>
<td>19-Nov</td>
<td>TBD/slack...</td>
<td>RR: TBD</td>
</tr>
<tr>
<td>21-Nov</td>
<td>TBD/slack...</td>
<td>RR: TBD</td>
</tr>
<tr>
<td>26-Nov</td>
<td>Project presentations</td>
<td></td>
</tr>
<tr>
<td>28-Nov</td>
<td>No class: Thanksgiving</td>
<td></td>
</tr>
<tr>
<td>3-Dec</td>
<td>Project presentations</td>
<td>Project phase 3 deliverable due</td>
</tr>
<tr>
<td>11-Dec, 1-3 PM</td>
<td>Project presentations</td>
<td>Final exam</td>
</tr>
</tbody>
</table>
Course title and number: Systems Thinking and Analysis, ISEN 640
Term: Fall 2014
Meeting times and location: TR 2:20 – 3:35 ETB 1006
Hours: 3 credits

Course Description and Prerequisites

Introduction to the systems thinking process, systems of systems, and the fundamental considerations associated with the engineering of large-scale systems, or systems engineering. These include systems modeling and design, the system development process (needs analysis, concept exploration, concept definition, engineering design, integration and evaluation) and systems engineering management.

Prerequisites
MATH 304 or approval of instructor.

Distance Learning (DL)
This is a DL course (Sections 700 and 720) and all course material including recorded lectures will be available on eCampus: http://ecampus.tamu.edu/

Semester Team Project
Students will form semester ‘teams’ comprising 4-5 students. Each team is going to work on an interesting real-life problem of their choice and apply the systems engineering approach to model, analyze and design a system model to address the problem. Students are encouraged to work on problems from their thesis or dissertation. DL students are encouraged to work on problems related to their line of work. Each team will learn to use systems modeling software to develop most of their systems engineering documents for the project. Finally, each team will write a project report (due last day of class) and will do a class presentation the last week of class. DL students must submit their recorded presentation and slides.

Learning Outcomes or Course Objectives

Students should be able to 1) understand the anatomy of engineered systems and their complex interactions; 2) formulate, analyze, and interpret issues associated with engineered systems; 3) use systems thinking techniques and software tools necessary for systems engineering practice; 4) model and analyze engineered systems using systems engineering tools; 5) function in multidisciplinary teams; 6) communicate ideas, verbally and in writing; and 7) appreciate national and global systems engineering issues from a variety of perspectives.

Instructor Information

Name
Lewis Ntaimo, Ph.D.
Telephone number
979 458-2360
Email address
ntaimo@tamu.edu
Office hours
TBA and by appointment (open-door policy)
Office location
ETB 4008
Textbook and/or Resource Material

No required textbook. **Recommended Text:**


**References:**


**Grading Policies**

The grade for the course will be based on homework and in-class quizzes, exams, semester project, and on the level and quality of your participation during class. No late assignments will be accepted. There will be an exam 1 (20%), exam 2 (20%) and a final in-class exam (20%) based on the material covered in class, homework and in-class quizzes (20%), and a semester project (20%). Grades will be assigned as follows:

- A (90-100%), B (80-89.9%), C (70-79.9%), D (60 – 69.9%), F (< 60%).

**Course Topics, Calendar of Activities, Major Assignment Dates**

Tentative important dates:

- **Exam 1**: Oct, TBA  
- **Exam 2**: Nov, TBA  
- **Final Exam**: Dec 17th, Wed 1–3 p.m.

**Team Project Report**: Last day of class, 2:20PM

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Required Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>Introduction to Systems Engineering</td>
<td>Kossiakoff, Ch. 1, 2</td>
</tr>
<tr>
<td>Week 2</td>
<td>Functional and Information Modeling</td>
<td>Kossiakoff, Ch. 3</td>
</tr>
<tr>
<td>Week 3</td>
<td>Systems Thinking Concepts</td>
<td>Hitchins, Ch. 1, Gharajedaghi, Ch. 2</td>
</tr>
<tr>
<td>Week 4</td>
<td>Systems Thinking Tools</td>
<td>Hitchins, Ch. 8, 9</td>
</tr>
<tr>
<td>Week 5</td>
<td>Systems Modeling</td>
<td>Wymore, Ch. 2</td>
</tr>
<tr>
<td>Week 6</td>
<td>Systems Modeling</td>
<td>Wymore, Ch. 2</td>
</tr>
<tr>
<td>Week 7</td>
<td>Theory of Systems Design</td>
<td>Wymore, Ch. 1</td>
</tr>
<tr>
<td>Week 8</td>
<td>Theory of Systems Design</td>
<td>Wymore, Ch. 1</td>
</tr>
<tr>
<td>Week 9</td>
<td>The system development process</td>
<td>Course notes, Kossiakoff, Ch. 4, 5</td>
</tr>
<tr>
<td>Week 10</td>
<td>Formulation of Issues and Constraints</td>
<td>Kossiakoff, Ch. 6, 7, 8</td>
</tr>
<tr>
<td>Week 11</td>
<td>Formulation of Issues and Constraints</td>
<td>Kossiakoff, Ch. 9, 10</td>
</tr>
</tbody>
</table>
Other Pertinent Course Information

None

Americans with Disabilities Act (ADA)

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For additional information visit http://disability.tamu.edu

Academic Integrity

For additional information please visit: http://aggiehonor.tamu.edu

“An Aggie does not lie, cheat, or steal, or tolerate those who do.”
Detailed Topical Outline

Section I – Basic Concepts (Weeks 1-2)

1. Introduction to Systems Engineering (Kossiakoff, Ch. 1-2)
   1.1 What is Systems Engineering?
   1.2 Identifying and classifying a system
   1.3 Systems Engineering tools (modeling, simulation, trade-off analysis)
   1.4 The system development process

2. Functional and Information Modeling (Kossiakoff, Ch. 3)
   2.1 Structure of complex systems
   2.2 Model of a complex system
   2.3 System building blocks
   2.4 The system environment
   2.5 Interfaces and interactions

3. Systems Thinking
   Part I: Concepts (Hitchins, Ch. 1, Gharajedaghi, Ch. 2)
   3.1 System Models
   3.2 System constructs
   3.3 Systems principles

   Part II: Systems Thinking Tools (Hitchins, Ch. 8,9)
   3.4 Causal loop/Influence modeling
   3.5 N² charts
   3.6 Case studies (Reading)

Section II – Systems Modeling, simulation and Design (Weeks 3-4)

4. Systems Modeling (Wymore, Ch. 1-2)
   4.1 Discrete (open) systems
   4.2 State transition diagrams
   4.3 System experiments (simulations)
   4.4 Input, output and state trajectories
   4.5 System performance
   4.6 Systems theoretical properties of system models

5. Theory of Systems Design (Wymore, Ch. 1-2)
   5.1 Input/output requirements
   5.2 Technology requirements
   5.3 Performance requirements
   5.4 Cost requirements cost
   5.5 Trade-off requirements
   5.6 System test requirements

6. Discrete Event System Specification (Zeigler, Praehofer and T.G. Kim)
   6.1 DEVS framework for modeling and simulation
   6.2 Fundamentals of modeling and simulation
   6.3 Basic DEVS concepts
   6.4 DEVS formalism
   6.5 DEVS OO simulation environment
   6.6 Creating DEVS models
Section III – Systems Engineering Processes (Weeks 4-5)

7. Systems engineering tools
   7.1 Overview of IDEF Methods
   7.2 Introduction to object oriented analysis and Unified Modeling Language (UML)
   7.3 IBM Rational Software Modeler

8. The system development process (Kossiakoff, Ch. 4-5)
   8.1 System life cycle models (DoD, ISO/IEC, NSPE)
   8.2 Concept development phases
   8.3 Engineering development phases
   8.4 Systems engineering documents

9. Formulation of Issues and Constraints (Kossiakoff, Ch. 6-10)
   9.1 Needs analysis
   9.2 Concept exploration
   9.3 Concept definition
   9.4 Advanced development
663 Engineering Management
Summer or Main Semester

TEXTBOOK:

All students must have their own “legal” copy of the book. No version of the book that do not have the US Copyright will be permitted.

Handouts: As required along with web-based analysis of selected topics

I. INSTRUCTOR:
Dr. Don Smith ENTEB 4th Floor 4068A
Phone: (979) 820-1042 Cell Office: (979) 458-2346
E-Mail: dr-smith@tamu.edu
Website: A new web site on eCampus will be established and
Postings to this site will begin the first week.

Office Hours: Smith: TBA depending upon the semester or term the course is offered.

TA: TBA
Office: _______________ E-Mail: _______________

II. Course Description
Integration of human relations, planning and control concepts, systems analysis and design, and principles of management oriented toward engineering (technical-based) functions within an organization; organizational design and administration as they impact along the product/system life cycle. Emphasis is placed upon the engineer transitioning from engineering functions to management/administration of engineering projects and the technical based personnel involved with those projects. Special emphasis is placed upon understanding management skills and leadership skills. Special topics will be covered in the areas of the leadership pipeline, motivational skills, conflict and negotiations, and aspects of project management. The special concerns of project management and organizing projects and project teams will be addressed.

The class will be divided into project teams to undertake the study and presentation of the cases at the end of each chapter. Additionally each team will be assigned to research selected technical articles in the area of engineering for compilation and a team presented summary report. Suggested web sites will be given out and topical areas assigned to each team.

Teams will be comprised of 3 – persons depending upon the final class numbers. DL students will be assigned teams and will have to work in a virtual environment not unlike what is common practice in today’s distributed environments. The thrust of this course is more in tune with the management and direction of technical professionals as opposed to general management.
III. **Course Philosophy:**

This course is primarily a readings course and requires significant in class interaction and discussion. In many instances, situations will be presented by the instructor with the intent of provoking discussion, questioning, debate, etc. It is imperative that all students become “involved” in the classroom and questions and comments are welcome.

IV. **Course Management and Classroom Behavior**

For on campus students timely and consistent attendance is assumed. Students are expected come to class prepared, with the appropriate text, and respond when called upon. As soon as the roster stabilizes a seating chart will be prepared and each name recorded on the seating chart. Students are expected to sit in that seat for the durations of the course. The purpose of the chart is to take attendance and to get to learn names.

Class attendance is expected by all on campus students. **Coming to class late is unacceptable** unless a student communicates a reasonable situation (like have a prior class on the West Campus.) If it is detected that a student is coming in late the student will be given one warning. If the late arrival situation persists without justification, the student will be dropped from the course.

V. **Classroom Behavior On Campus Students**

It is assumed that as graduate students there is a level of maturity and responsibility present is all students. Issues in the past in many ISEN classes that have computers in the classroom involve activities like web surfing, sending and receiving e-mail, and generally doing something else rather than being engaged in the class. The following policy applies for this course.

1. Unless permitted by the instructor web surfing and or other computer related activities that do not conform to the requirements of the class will not be permitted! The first time a student is engaged and discovered in such activity an oral warning will be issued and so noted on the seating chart. If a second violation is detected the student will be asked to leave the classroom and meet with the professor after class. This constitutes a second warning. Any subsequent violation will result in the student being summarially dismissed from the class with a referral to the ISEN department head and or the Associate Department head and a failing grade will be assigned.

2. Arriving late to class is disruptive and will not be tolerated. Come on time, be in your assigned seat, pay attention and contribute. Coming late to class (unless a reasonable justification for being late is presented) will result in dismissal from the course and a failing grade.

It is unfortunate that these policies have to be put in place for adults. However, such activities as described above have gone on in the past and as such, negate from a positive learning environment.

VII **Distance Learning Students**

First, I have the greatest respect for those individuals who enroll as distance learning students. All of them hold down jobs and or military assignments. With the demands they take on
combined with the rigors of distance learning life can be most challenging. That shows a substantial amount of self discipline and direction.

VIII. Some issues regarding DL students:

1. When exams and assignments are posted the DL student should make every effort to meet the prescribed deadlines associated with the assignment. If a delay is anticipated the student must contact me explaining the situation. In the past I have made every effort to accommodate variances in due dates. The one situation I have to be tough on is concerned with the major exams. Exams will be transmitted with enough advance time to take and submit back. The submission date must be met as I cannot have exams outstanding in order to grade and report the results.

2. E-mails:
   By university rules your only e-mail will be the TAMU assigned E-mail. However I do take an alternate e-mail address as a back up. Each student will be sent a questionaire to fill out the first week and send back to me. Additionally, when you send an E-mail make sure you identify in the subject part of the e-mail that “663 Summer or 663 Fall or spring” is part of that subject. At times I will get an e-mail and I have to figure out from the name what course is involved. So please just tag “663” as part of the subject line and that will help.

3. Part of each exam will involve discussion questions where the student writes a reply. I prefer that the student open the word document, cut and paste the discussion questions into a blank document then within that same document respond to the question (a MS Word document.) Then save the file using the following file name:

   “663_ExamX_yourlastname.doc”

   where X is the exam number. Then e-mail that document back to me. When it comes in I know immediately from the file name what the file is.

4. If an unexpected event occurs that will take you away from keeping up I need to know about it. Taking vacations and missing class time or asking for more time to take an exam will cause delays for the entire class. We simply can’t afford that. Staying on track and on time is critical.

IX. First Week:

The first week of the course is involved with roster stability as there will be adds and drops most likely. All students should refer to the published TAMU University Calendar for signigicant events/deadlines pertaining to the current semester. Remember, we are engaged with a 10-week format and time goes by rather fast so the pace will be brisk.

All students that have registered for the course must be present for the first week. Being out of town or out of the country knowing the official class schedule has been established and not being present is grounds for being dropped from the course. Being absent the first week disrupts to organization of the course and the assignement of the case analysis teams.
1. General overview of engineering management
   Managing vs. Leading
   The realm of technical management

2. The environment of engineering management - Text: chapter 1
   The functions of management
   Management skills mapped with leadership skills

   Case 01: “A Day at Seagraves- Dr. Pope’s typical work day as a manager.”
   This is a classic case and is often cited in other books.

3. The Planning function – Text: chapter 2
   Systematic and sensible planning activities
   Hierarchical planning - work breakdown structures
   Risk and uncertainty elements

   Case 02: Office Equipment Corp

4. Organizational structures – Text: chapter 3
   Functional and matrix formats
   Agile organizations

   Case 03: The Warden Company

Exam No. 1. A combination of multiple choice and discussion questions (100 points)
Date TBA

   Cross functional/multidisciplinary teams
   Interface management

   Case 04: American Products, Inc.

7. Creativity and innovation – Text – chapter 5
   Managing/directing creative individuals in a teaming environment

   Case 05: Government Structures Laboratory

8. Motivation – Text – chapter 6
   Motivational strategies and techniques
   Needs analysis and need levels for technical personnel

   Case 06: Southeastern Research Institute

Exam No. 2: Same format as Exam 1. (100 points)
Date: TBA

9. Leadership – Text – chapter 7 (Strong Emphasis here)
   Leadership skills
   The concept of the Leadership Pipeline within well managed technical organizations
   Transactional and Transformational leadership

   Case 07: Capital Aerospace
10. **Control of projects – Text: chapter 9**  
    WBS, Gantt charts, PERT/CPM network analysis  
    Budgeting and Schedules for control purposes  
    Some sections of this chapter will have minimal coverage  
    Case 10: Elrod Manufacturing

**Exam No. 3: Final Exam:** Chapters 7 and 9  
As per the TAMU university calendar (provided based upon the semester or term the course is offered.

The date for the final exam will be ________________ (established by the semester or term the course is offered.)

Another important point is that under no circumstances will a student be permitted to take the final exam early due to wanting to leave the campus prior to the final exam date. Only an official recognized university reason will be considered. Students wishing to take the final exam after the official scheduled final exam date will have to present compelling evidence and reasons for consideration. There is no guarantee that an extensions will be granted. Failure to take the final at the scheduled time may result in a “0” grade for the final which will result in a “F” grade in the course.
XI. An Important Component of the Course: The case studies at the end of each chapter

Note: Each chapter presents a case problem relating to the information supplied in each chapter. The cases serve to amplify the chapter material and provoke thinking and applying the techniques and principles associated with the chapter material.

Case Teams

As previously stated the class (both on campus and DL) will be formed into teams by the professor. Based upon the final roster counts the teams will be 2-3 students. DL students will be teamed with DL students and hence, communications among team members will be different that that among the on campus population. The team assignments will occur at the beginning of week 2 when the class rosters are “stable.” A specific handout will be posted to the E-Learning web site. There will be nine (9) cases assigned throughout the summer term. Each case will carry 40 points per case for a total of 360 case point. When the cases are evaluated the team will be a team score applied to all members of the team. At the conclusion of the semester each team member will be required to fill out a confidence team evaluation form and rate the performance and contribution of the other team member(s). A team rating spreadsheet will be provided and a final numerical score will be obtained. A team member or members receiving lower than expected evaluation will have the appropriate point deductions taken from the final earned points at the end of the course.

Literature Search Team Assignment

Each case team will be required to conduct a literature search (web based) to uncover and obtain relevant research papers in the area of engineering management. Each team will be required to uncover and report on two relevant research papers they find on the web. In order to prevent teams using the same paper I will have each team send me their paper title so I can cross match topics such that no two teams submit the same paper. The first paper submission will be at the 5-week point and the second paper will be at the 9 week point in the term.

XII. BASIS OF GRADES:

<table>
<thead>
<tr>
<th>Points</th>
<th>% of Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>57%</td>
</tr>
<tr>
<td>180</td>
<td>34%</td>
</tr>
<tr>
<td>50</td>
<td>9%</td>
</tr>
<tr>
<td>530</td>
<td>100%</td>
</tr>
</tbody>
</table>

Note: Not attending class on a regular basis and coming prepared can and will mark down a team (on campus.) The team is responsible for motivating team members to act professionally and responsibly. Thus, the entire team is accountable for the actions or lack of action by any give team member.

XIII. Grading Policy

Each exam and assignment will carry a predefined point value. At the conclusion of the semester, points will be accumulated based upon the weights given above. Final letter grades
will generally follow the University (90-80-70) rule and the instructor reserves the right to evaluate and award letter grades that might fall slightly below the 90-80-70 guidelines. However, this can only be determined at the conclusion of the semester. It is well known that all students want an “A” in a course. “Wanting” and “earning” are two different concepts. One can want an A all they want…but they have to earn it first!

XIV. **Point Deductions**

As shown above the total number of points in the course is 580. If we encounter the unfortunate situation of violation of class policies and excessive absences then a suitable number of point deductions will take place at the end of the semester to adjust (downward) the final number of points earned by a student. If you do not want deductions then simply follow the policies of the class and all will be well. Deduction categories are:

1. Coming late to class: 3 points per occurrence
2. Violation of computer usage in class 2 points for the first violation--then point deductions will double for each successive violation. (2\textsuperscript{nd} violation = 4 points; 3\textsuperscript{rd} violation = 8 points, etc)
3. Missing a major scheduled examination without proper notification or justification: loss of the total points for that exam (fatal!)

XV. **Exams:**

Exams may not be taken late unless compelling circumstances are presented. In the event you must miss a test due to an emergency, strong documentation will be required as per the current TAMU regulations. Failure to provide such documentation may result in a “0” grade for the respective examination. DL students, who work at full time jobs and travel, will be granted reasonable latitude due to the unique nature of their work and environment.

Exams will be objective with some short answer questions. You can expect a mixture of true-false, multiple choice, and short answer. Note: Exam dates will be announced at least 5 days in advance of the exam. All students are expected to take the exam at the scheduled time. Going on an interview trip is not an excused absence for exam purposes. You can expect an exam approximately every 3 weeks and the schedule of topical coverage will be designed as such.

XVI. **Aggie Honor Code**

After you graduate and enter the workforce your boss will expect that you have been educated. In the “real world” there are no make up exams or partial credit. Therefore, cheating will hurt you in the long run. I expect everyone to follow the Aggie Honor Code, which states:

“An Aggie does not lie, cheat or steal or tolerate those who do.”

All suspected violations of the Aggie Honor Code will be referred to the Administration for adjudication according to the Honor Council Rules and Procedures. Remember: If you observe academic dishonesty and fail to report it to the appropriate individual (instructor or Dr. Curry) then you have violated the Honor Code. ([http://www.tamu.edu/aggiehonor/](http://www.tamu.edu/aggiehonor/)). The instructor reserves the right to drop a student for a violation of the Honor Code and assign a failing grade.
XVII. **Americans with Disabilities Act (ADA) Policy Statement**

The Americans with Disabilities Act (ADA) is a federal antidiscrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities in Room 126 of the Koldus Building, or call 845-1637.

XVIII. **Important Dates for the 2012 Summer session**

Based upon the current offering semester or term.
ISEN 667
Course Outline
Fall, 2014
ETB 1027 – T-Th 9:35 – 10:50
Instructor: Dr. Don Smith, P.E.

Office: ETB 4068-A Office Phone: (979) 454-2346 E-Mail: dr-smith@tamu.edu
Office Hours: M-W-F 9:00AM – 11:30 AM or by appointment

TA/Grader: None

For Distance Learning Students:

INEN Distance Learning Administrator:
Ms. Erin Roady
Graduate Program Coordinator
Dept. of Industrial and Systems Engineering
Texas A&M University
Ph: 979-845-5536
erinroady@tamu.edu

Ms. Roady handles graduate administrative issues only and is not to be contacted for specific course information.

Graduate Advisor and DL Director:

Dr. Yu Ding
Professor of Industrial & Systems Engineering and of Electrical & Computer Engineering
Director of ISEN Graduate Programs and ISEN Distance Learning
Dept. of Industrial & Systems Engineering
Texas A&M University
College Station, TX 77843-3131
Phone: 979/458-2343
yuding@iemail.tamu.edu

Dr. Ding heads the ISEN graduate distance learning program and is your contact for issues relating to overall distance learning activities and degree plans.
Text:

by William G. Sullivan (Author), Elin M. Wicks (Author), C. Patrick Koelling (Author)  

Since a number of students taking this course have not had a prior course in engineering economy or are far removed from having a course the text serves a basic treatment of the subject. However, with handouts from the supplementary source, topics are amplified and extended from a basic level to a more advanced level.

Supplemental Notes provided to amplify basic course materials taken from:  
The Economic Analysis of Industrial Projects, Lynn E. Bussy, (1978), Prentice –Hall (out of print)

**Note:**

Earlier editions of the text are not acceptable due to extensive changes for the 16th edition from prior editions. Suggested problems will be assigned for each chapter as we progress through the material. Each student MUST have the text book and bring it to each class period. **International versions without the copyright are illegal and if detected will be confiscated.**

**Learning Objectives**

The purpose of this course is to understand and apply the fundamental tools of engineering economy to engineering type projects involving investments and returns. Understanding of cash flow diagrams, derivations and application of the time value of money relationships and after-tax cash flow analysis. Additional topics include understanding of basic financial aspects of the enterprise and the proper use of interest rates in the analysis of future cash flows for single and multiple projects. Advanced topics relating to a detailed analysis of rate of return, mixed investments, and internal and external interest rates are covered. The course involves substantial spreadsheet analysis and applications.
**General Course Requirements**

Background in knowledge of computer-based spreadsheets (Microsoft Excel-Windows OS) and graduate standing. Several Excel spreadsheets will be presented that incorporate visual basic macros. It is expected that students will take the time to familiarize themselves with basic macro construction within the Excel framework (MS Office2007 suite or 2010 version) and have demonstrated ability in spreadsheet design and formula construction.

Additionally, all students (on Campus) enrolled for this course must have a TAMU E-mail address with the ability to send and receive attached documents, spreadsheets, and other material suitable for electronic transmission. E-mail addresses and log on computer accounts will be established the first class meeting for the local students and all on campus students must have a TAMU authorized e-mail address or an alternate e-mail address. Students must ensure that their respective e-mail accounts are maintained and unneeded files purges from the server.

A student’s e-mail address should reflect the identity of the student as much as possible. The first two class days will allocate time for students to record on a provided spreadsheet their respective e-mail address. The primary e-mail address MUST be a TAMU e-mail address – no exceptions! Note: DL students, in addition to their A&M e-mail may supply one alternative email address.

Distance learning students must have suitable e-mail capability and either cable modem or DSL connection capability. Class presentations will be recorded, encoded, and posted to the class web site normally within 24 hours. DL students can log onto the web site, right click on the selected file and accomplish the download within minutes.

**E-Campus**

eCampus will be the primary source for posting course materials and all students will have access and are expected to continually check for materials. Emails will be sent alerting students to current course material postings. The eCampus link is: [http://ecampus.tamu.edu/](http://ecampus.tamu.edu/)

**Computer Accounts**

All students must have a computer account with log on ID and individual passwords issued by the Industrial and Systems Engineering Department. By accepting and using this account, students are honor bound to abide by the policies and regulations of the Industrial Engineering Department and the Computer and Information Services of Texas A&M University. The sharing and or communication of individual log on IDs and passwords is strictly forbidden and if detected and substantiated, the student(s) so involved will be subject to strict disciplinary action. Ms Roady can assist in setting up your ISEN computer account. [erinroady@tamu.edu](mailto:erinroady@tamu.edu)

On campus students who do not have an ISEN computer account you can go to Room ETB 3005-B or Room ETB 3019 for the form. Fill out immediately and turn in to authorize you ISEN account.
Distance Learning Students and Exams:

All of the exams will be transmitted to each DL students. It is assumed that all directions will be followed as per the TAMU honor code. Sufficient time will be given to each student owing to work schedules, etc. It will be necessary for each DL student to manually solve the exam problems and then scan the results and paste into a word document. **DL exams must be electronically transmitted back to Dr. Smith as a MS Word file.** In order to accomplish this, the DL student must be able to **scan their work, paste into a word file and then e-mail to dr-smith@tamu.edu.** The file can then be graded (digital mark up) and then transmitted back to the student.

Class Attendance and Classroom Decorum (On-campus Students)

The first week of any semester is dynamic with students adding and dropping throughout the week. Since part of the course will involve working with spreadsheet models on campus students will be involved with the computers in the classroom. One issue involves students who choose to surf the web, send/receive e-mails, etc and generally involve themselves in non-class room activities. We ask that you simply refrain from such activities. **If detected, the instructor will issue one warning and subsequent violations will result in the student be dropped from the course.**

Not Attending Class (On campus students)

Simply stated, “**not attending class is NOT an option**” unless there are reasonable circumstances presented. As each class lecture is posted to the class web site, some students feel they do not have to come to class on a regular basis. This will not be tolerated! At the end of the first week of the course a seating chart will be constructed and daily roll will be taken. **Excessive absences** will result in a grade deduction at the end of the course based upon the discretion of the instructor.

If a student has accumulated 3 unexcused absences the student will be warned that an additional absent without a valid University excuse will result in the student receiving a letter grade reduction at the end of the semester. Unexcused absences in excess of 5 will result in the instructor instituting dropping the student from the course.

During the second week of the semester, a seating chart for on campus students will be constructed. Students should seek out where they wish to locate in the classroom and daily attendance will be taken from that information. The seating chart will be constructed the first class period of the second week of class for on campus students so you must be present!

Attendance is expected unless university excused situation arise. Job interviews are not university-excused absences. If a student knows in advance that he or she will have to miss please let me know in advance if you can.

The recordings of each class sessions are posted primarily for the distance learning population. For on campus students, having access to the daily presentations is an “added” convenience and not intended to circumvent attending class on a regular basis.
Simply stated, (for on campus students) if one is not in class then if questions arise it is difficult to ask if you are not in attendance!

**Quizzes and Homework**

At any time, without warning, a short quiz (5-10 points) based on the homework or in-class examples might be given. Homework assignments will not be collected or graded. However, at the time of each major exam, the instructor may permit study notes and homework problems (if you have worked them out.) Students who are not present IF an unannounced short exam is given, those who are absent may not be able to take the exam. A “0” grade will be recorded in for that student.

**Topics and Tentative Schedule:**

Please note: There might be situations arise that will call for modifications to the schedule. This could be especially true with the advent of a perceived serious flu season here in the US. The following schedule is subject to change/modifications as situations may require.

Note: Each semester the course is offered I tend to change the problem assignments. When we begin a chapter or segment the assigned problem set will be E-mailed and posted to ELearning (ECampus later on.) Note: this course involves extensive Excel spreadsheet analysis and formulation of certain problem types. It is assumed the student is proficient with Excel!

**Topics**

- Overview and history of engineering economy
- Financial objectives of the for profit firm
- Financial theories related to the for profit firm
- Cost and cost estimation concepts
- Derivation of time value of money relationships (discrete and continuous)
- Economic evaluation of a single project
- Fundamentals and details of internal rate of return with mixed and pure investments
- Polynomial formulation of cash flows and root finding using MatLab or SciLab
- Economic evaluation of multiple projects and incremental analysis
- Depreciation and income taxes (US Federal approach)
- Detailed analysis of after-tax cash flows

**Examinations:**

3 examinations spaced throughout the material
Exam 3 will include a comprehensive after tax cash flow case
Exam 1 and 2: 120 points
Exam 3 (final) 200 points (part will be take-home)
440 total points: University (90 – 80 – 70 – 60) grade standard applies.
Exam Review Policy

Students will have 2 days to have their exam reviewed by the instructor. After that time period the exam score stands and will not be re-graded or reviewed after the 2-day time period expires. To avoid problems please to do not ask to have a prior exam reviewed after the 2-day time period as it will be denied.

Final Exam Date as set by the University:

For students making plans to depart the campus for the holiday break must be aware of the final exam schedule. Avoid booking transportation during the final exam time period. Students will not be permitted to take any exam early unless unusual circumstances prevail (Instructor discretion.) Under no circumstances will a student be permitted to take the final early based upon travel needs unless a documented family emergency is presented.

Classroom Computers: During lectures, the computer monitors should be turned off unless I have asked you to use the computers as part of the lecture or exam. Surfing the web and or e-mailing, or any other non-class related activity is not permitted. Offenders will receive one warning. Any further violations will result in the student being dropped from the class.

Cell Phones: The use of cell phones during class times or lab times while I or the TA are talking or while you are taking a test is prohibited. Violations during a test will result in a zero on the test. Exceptions to this policy are expected emergencies. But reset your phone to a vibrate mode—not a ring mode.

Class Attendance: Class attendance is not optional. You are expected to attend all class lectures except for university excused absences. Attendance is taken from a seating chart for the on campus students.

Office Hours:
I am generally in every morning of the week and right after class. All other times will be handled by appointment as needed.

Academic Integrity: “An Aggie does not lie, cheat, or steal or tolerate those who do.” It is the responsibility of students and instructors to help maintain scholastic integrity at the university by refusing to participate in or tolerate scholastic dishonesty. (See the web site http://www.tamu.edu/aggiehonor for the Honor Council Rules and Procedures.)

The Americans with Disabilities Act (ADA): is a federal antidiscrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Service for Students with Disabilities in Cain Hall, Rm. B118, or call 845-1637.

Special Needs Students

If any student has special needs in terms of taking exams they are to contact of Student Life
(845-1637) office for a professional consultation. That office will inform me of any special arrangements that may have to be made for taking exams.

**Use of Language Dictionaries**

For international students, the use of an English language dictionary is permitted for in class exams.

### Fall 2014 Schedule – Important Dates

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 20</td>
<td>Wednesday. Graduation Application opens for all students planning to graduate in December 2014.</td>
</tr>
<tr>
<td>August 29</td>
<td>Friday, 5 p.m. Last day to register for fall semester classes. Refer to <a href="http://finance.tamu.edu/sbs">http://finance.tamu.edu/sbs</a> for tuition and fee due dates.</td>
</tr>
<tr>
<td>September 1</td>
<td>Monday. First day of fall semester classes.</td>
</tr>
<tr>
<td>September 5</td>
<td>Friday, 5 p.m. Last day for adding/dropping courses for the fall semester.</td>
</tr>
<tr>
<td>October 3</td>
<td>Friday. Last day to apply for all degrees to be awarded in December without a late fee.</td>
</tr>
<tr>
<td>October 20</td>
<td>Monday, noon. Mid-semester grades due.</td>
</tr>
<tr>
<td>November 13-December 2</td>
<td>Thursday-Tuesday. Preregistration for 2015 spring semester.</td>
</tr>
<tr>
<td>November 18</td>
<td>Tuesday. Bonfire 1999 Remembrance Day</td>
</tr>
<tr>
<td>November 21</td>
<td>Friday, 5 p.m.</td>
</tr>
<tr>
<td>November 27-28</td>
<td>Thursday-Friday. Thanksgiving holiday.</td>
</tr>
<tr>
<td>December 8</td>
<td>Monday.</td>
</tr>
<tr>
<td>December 9</td>
<td>Tuesday.</td>
</tr>
<tr>
<td>December 10-11</td>
<td>Wednesday-Thursday. Reading days, no classes.</td>
</tr>
<tr>
<td>December 12, 15-17</td>
<td>Friday, Monday-Wednesday. Fall semester final examinations for all students.</td>
</tr>
<tr>
<td>December 18</td>
<td>Thursday, 6 p.m. Final grades for degree candidates due.</td>
</tr>
<tr>
<td>December 19</td>
<td>Friday, 5 p.m. Last day for December undergraduate degree candidates to apply for Tuition Rebate.</td>
</tr>
<tr>
<td>December 19-20</td>
<td>Friday-Saturday. Commencement and Commissioning.</td>
</tr>
<tr>
<td>December 22</td>
<td>Monday, noon. Final grades for all students due.</td>
</tr>
<tr>
<td>December 24-January 2</td>
<td>Wednesday-Friday. Faculty and Staff holiday.</td>
</tr>
</tbody>
</table>

* All dates and times are subject to change.
ISEN 669


Supplemented by notes and handouts pertaining to the Palisade Corporation’s Decision Tools Excel addins.

Course Objectives:

This course exposes the student to the various Excel-based analysis tools useful for evaluating a variety of engineering, financial, and business type decisions that have been modeled or could be model within the context of Excel. The following add-ins to Excel are utilized. This add-in come with the companion CD and are also available to the students in the various computer labs for the on-campus students. The material is presented through extensions of engineering economy applications.

The add on software from Palisade Corporation, Decision Tools, student edition are:

1. **TopRank** – for evaluating existing Excel models to determine what inputs influence the targeted output cell(s) and the degree of correlation that exists between the input variables. The various input variable can be manipulated within selected ranges to produce a range of output values for analysis. This module works only with Excel in Office 2003 and will not function within Office 2007.

2. **Precision Tree** – This ad-on will permit the actual drawing of a decision tree used for sequential decisions and will evaluate the optimal path through the network that you define. The marginal probabilities will be calculated along with the expected value of the various paths. This add-on is useful for sequential type decisions and will illustrate dominance (if any) for various strategies.

3. **@Risk** – This add-on permits the user to define a cell or cells as a random variable(s) and then execute a number of iterations that target an output cell. The output cell then changes values and upon completion of the analysis, the user can see the distribution of the target cells and form probability type statements. Students who have not had or will not be taking INEN 625- Systems Simulation will be exposed to the basics of simulation via this package.

4. **Best Fit** – This is a general purpose add-on that permits the user to cut and paste values and then see the distribution of the values and fit a number of candidate theoretical distributions. Best Fit is a general purpose software tool that can assist in the analysis of any data set regardless of the source of the data. Raw data is imported into Best Fit by a simple cut and paste procedure then the analysis is “automatic.” The challenge is the proper interpretation of the results and these issues will be covered.
Fundamentally this course is problems-based with emphasis on modeling engineering economy type problems, execution of a given analysis and the proper interpretation of results. While the underlying theory is covered this course most of the course is practical applications and tools oriented. The expectation is that all students will actively model in Excel and individually model

**General Course Description:**

The study and understanding of modeling complex decision situations relating to engineering economy applications in a logical and structural manner. Complex decision problems are considered and modeled using decision trees, sensitivity analysis, simulation, and statistical analysis techniques. Software supplied by Palisade Corporation (Decision Tools) is utilized within the framework of Excel. Decision situations are considered within the context of risk and uncertainty and modeled and evaluated accordingly. Essentially this course extends concepts of the economic analysis of industrial and governmental projects into the realm of probabilistic treatment with associated analysis of sensitivity issues. The main analysis platform is Microsoft Excel with the *Palisade Decision Tools* add in macros.

**TAMU/ISEN Student Computer Accounts – On Campus Students**

All on campus students must have a valid ISEN departmental computer account that active for the current semester. If a student does not have an account they are referred to the ISEN Help Desk on the third floor of the ETB building to obtain an account. Computer logon ID’s and Passwords are considered private and subject to the current rules of Texas A&M University. Passwords are NOT to be shared with any individual for any purpose. If you do not have a TAMU INEN account (on-campus students) go to room 224-A and fill out the form. Do this immediately please. This does not apply to DL students as DL students do not have access to the firewall system.

This course will make active use of SharePoint software and students will be required to have their own logon and password credentials. Details on this point will be covered the first week of the course.

**Streaming Version of Each Class Lecture**

All class lectures are recorded using the Camtasia capturing software along with the audio track of the lecture. At the end of a given class period, the file is moved and then compressed for web streaming or downloading. Normally, a class lecture will be posted to class web site either the afternoon following the lecture or by the next morning. Students can then view the streaming media as needed.

If a student asks a question in class, I need to repeat the question for the audio track so please speak clearly and concisely so I can understand the question and then repeat it for the benefit of the DL students.
At the end of each class period, I have to take several minutes to ensure that the lecture was effectively recorded. During this time period I would appreciate if the on-campus students would refrain from asking question until the validation process is concluded by me at the instructor terminal.

**Prerequisite(s): ISEN 667, STAT 630 or equivalent (STAT 601 or STAT 610)**

It is assumed the student has a sound, working knowledge of basic probability and an exposure to engineering economy topics. Students who do not have the stated prerequisite will be dropped from the course the first week.

**Basic Skills Assumed:**

It is assumed that all students possess a working knowledge of Excel and can effectively build and format models. Office 07 is the de facto version of Microsoft Office that will be used in this course.

**Class Format**

This course in one of a sequence of Industrial Engineering graduate level courses that support both the on-campus and distance learning programs. Two distance learning (DL) programs are part of the on-going effort of the Department to serve the needs of engineers employed in business, industry, military, and government operations. The first program, Masters of Science in Engineering Systems Management, is a university-sponsored distance learning degree for student holding an undergraduate level degree in engineering or another business related degree. The second program, Masters of Engineering in Industrial Engineering is for students holding an undergraduate degree in an ABET accredited area of engineering.

This course will make extensive use of WEB-based materials, streaming media, and videotape. Supporting assets such as lecture slides sets; word documents, etc will be posted to the WEB site throughout a given week. Enrolled students are responsible for accessing the site and extracting needed resources.

**Web Site to support the Software**

Palisade Corporations provides a variety of helpful materials associated with the software. The main web address is:


For all students, especially DL students: A student version of the software is available at: http://www.palisade.com/

  Click on PRODUCTS
  Click on ACADEMICS
  Click on FOR STUDENTS
You can purchase the student version (OK for our purposes) with a one year life. The cost is $50 (credit card) and your e-mail address. You will be sent an e-mail with the link to download and install or the system may let you download immediately. DL students must have the software. Once the software is downloaded follow the installation instructions. You must have either OFFICE 03 or OFFICE 07. Operating system can be WINXP, Vista (32 bit) or WIN7 32 bit. If you have the 64 bit version let me know if there are installation problems ASAP. **DL students must do this the first week so we can get started the second week with the software!**

Specific on-line tutorials from the web can be viewed by going to:


It is expected that all students will utilize this resource early in the semester and work towards “teaching themselves” the basics of the software.

**Case Studies**

The following web address supports a number of cases relating to Decision Tools. Several articles using the software can be found at:


Students are expected to check these articles out over the first 3-4 weeks of the semester as they add up to date information not in the text/Supporting Topics – Individual Review

Students early in the course must review the following sections of the assigned text individually. These sections (chapters) constitute a base-line knowledge that is assumed in the assigned chapters for this course.

**Topics Covered:** (In order) Subject to change by end of first week

Basic Topics:

1. Structuring difficult decisions
2. Review of probability basics and Bayes Theorem
3. Risk and Uncertainty
4. Decision trees and value of perfect information (Precision Tree)
5. Sensitivity of structured decision problems (Top Rank)
6. Simulation of engineering economy models using @Risk

Chapters used from the 667 course + expanded problems:

1. Chapter 7, Depreciation and Income Taxes (Corporate perspective) with emphasis on after tax cash flows of industrial projects.
2. Chapter 9, Economic replacement analysis
4. Chapter 11: Breakeven and Sensitivity analysis
5. Chapter 12: Probabilistic analysis with simulation of project economics and decision trees
6. Chapter 13: The capital budgeting process, cost of capital models, leading decisions, and capital allocation models

The Decision tools software will be applied to each of the topics shown above.

Student-based software associated with the course will be available along with the resources of the INEN computer group to support the software. All of the above software is accessible from the various IE departmental computing labs so long as each student has an active IE computer account.

Major Examinations: 3 Major exams, two during the semester and the final exam at the university scheduled final time.

Final Grade Determination

1. Two in-class exams
2. Exam 1: 25% - chapters 7 and 9
   Exam 2: 25% - chapters 10 and 11
3. Final Exam: 30% (parts of which will be cumulative.) chapters 12 and 13
4. Assigned case projects: 20%

Not attending class is unacceptable. I expect students to come to class on time and be prepared at all times. I reserve the right to give short, end of class “reading exams” that can constitute part of the 20% of the final grade determination. If a student misses any one of these reading exams they cannot be made up unless a University documented reasons is presented.

According to the current TAMU University standards, the following grading scheme will be applied.

90% or greater: A
80% to < 89%: B
70% to < 79%: C
< 70%: D or F (instructor assessment)

Note:

At the termination of the course when all data pertaining to examinations, projects, and attendance, the instructor always reserves the right to “curve” the final composite score. Additionally, based upon unforeseen circumstances, the instructor reserves the right to modify the course materials and topics covered with advance notice. However, any curving of final grades will not be known until all work has been completed, turned in on time, and evaluated.
**Student Responsibilities:**

Much of the course will require the communication via e-mail. On campus students MUST have an active TAMU e-mail account. DL students must also have an e-mail account that can send and receive documents. If a DL student’s organization filters e-mail such that slide sets, spreadsheets, etc are blocked, then the student must have an alternate e-mail address.

A recurring problem has been the fact that on occasion, students do not erase the attached files that are sent to them and their allocated disk space fills up. Thus, when another set of attached material is sent, the transmission gets rejected and “bounced back” to the sender. This becomes a very irritating situation for the instructional staff. Thus, students are encouraged to clean their e-mail space several times a week. If this problem persists, the student’s name will be dropped from the class e-mail roster.

If a student changes or adds an e-mail account, please so communicate to the instructional staff.

**Computer Virus Problems**

Computer viruses are and remain a significant problem. It is highly suggested that students use an up-to-date virus detection program (suggest the latest version of Norton Anti-Virus software). Students using university supplied computer labs must virus scan their respective files before transmission. Distance learning students must follow the same requirement. A student who fails to take normal and reasonable measures to ensure that his/her work is not virus infested may be dropped from the class roster.

**Class Attendance**

Class attendance is a significant part of the course. This class meets two times a week for 3 hours. On-campus students are expected to attend each class session. If the student has to miss a class, he/she should make every effort to communicate to the instructional staff. The class web site will contain the sequence of in class lectures for viewing. However, some students then think they do not have to come to class and simply watch the video stream. If you are an on-campus student, you are advised not to make that mistake. Class attendance is your responsibility and if you miss numerous classes and then come in and ask for help, that issue will be immediately pointed out to you. NOT COMING TO CLASS IS NOT AN OPTION!

It is recognized that distance-learning students normally hold down full time jobs and may have to travel as part of their job responsibilities. When business travel constraints occur, the student is expected to contact the professor and communicate his/her individual situation in advance of the travel – especially with exams. We must “communicate.”

Please make every effort to be on time. For on-campus students who have classes away from the ETB building - (like the West Campus), I know it is not possible to make it over to the ETB
complex in the limited time permitted. Please let me know that fact in advance and come in the back of the classroom so as not to disrupt from the front. Students who continually come late to class present a problem. If this becomes a habit then the instructor (with adequate warning) will drop the student from the class.

**Taking Scheduled Examinations**

It is expected that all students will take the exams at the scheduled time and place that is communicated. Exam dates will be announced at least a week in advance. Any student who misses a scheduled exam without at least attempting to communicate to the instructor will receive a “0” for that exam. For most situations, some accommodation can be worked out to fit the student’s particular situation. For this class, major exams will be given at night in Z203, either on a Tuesday or a Thursday night beginning at 6PM. In this manner students will have adequate time to take the exam. Major exams consist of an objective part and a modeling part using the computers in Z203. Exam dates will be communicated at least a week in advance. Any student who has a documented situation can arrange for a makeup with the instructor and must be finished in a timely manner (ut to the instructor.) When a major night exam is scheduled, (a Tuesday or Thursday evening) that day’s class period will be optional and used a review session.) Students will be permitted dictionaries for all major exams.

For DL students, every effort will be made to accommodate individual work and travel schedules but that must be communicated to me pending the posting of the exam.

The final examination for this course is published in the TAMU Schedule of Classes for the given semester. **All students are expected to be present at the time and place so specified.** Taking the final exam at a time other than the scheduled time and place will normally not be permitted but with evidence of proper circumstances, each case will be handled by the instructor.

You now know the time and date of the final for this course. Please schedule to be present and prepared. Requests to take the final early will not be honored unless a documented University reason is provided.

For international students I do permit the use of a dictionary to assist if needed by the student on any in-class exam.

**Other Student Responsibilities:**

1. Come to class on time and prepared
2. Maintain reasonable dress and personal hygiene
3. Assume responsibility for the bulk of your own education
4. Maintain a professional attitude at all times
5. Meet the standards and assignments specified in the course
6. Minimize “arguing” over test evaluations
7. Understand and follow the TAMU Code of Conduct pertaining to all academic matters (in class, examinations, personal conduct, personal honesty and integrity.)
8. Do not be fearful of asking question in class. Speak up; others may have the same concerns as you.
9. Want to learn!
10. Cell phones OFF please during class time
11. Web surfing, e-mailing, etc during class hours is a problem so please refrain from such activity. Thank you. (If this becomes a chronic problem the student will be dropped from the course.)
12. Final grades are earned by the student. It is performance that counts.

All semester examinations are to be given in accordance with the schedule published by the Office of the Registrar. The final examination shall be designed to cover a period not to exceed two hours. Courses carrying one credit hour of theory or practice shall have one hour examinations given during the last class period.

When a student is scheduled for three final examinations in one day, the student may request rescheduling of one of the examinations through his/her dean. The dean, department head and faculty member will make every effort to accommodate the student when such a request is made. Final examinations for classes meeting at times other than those listed above will be scheduled during the week of finals at a time agreed upon by the faculty member and students. Please see Texas A&M University Student Rules, [http://student-rules.tamu.edu/rule8.htm](http://student-rules.tamu.edu/rule8.htm).

In the past some students have booked airline flights in order to leave early. Please make your individual travel arrangements without interfering with the final exam as university rules do not permit giving final exams outside of the published schedule.

**Americans with Disabilities Act (ADA) Policy Statement**

The Americans with Disabilities Act (ADA) is a federal antidiscrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities in Room 126 of the Koldus Building, or call 845-1637.

**The Honor Code**

The Honor Code at Texas A&M is clear and simple:

“We do not lie, cheat, nor steal; nor tolerate those among us who do.”

Taking short cuts, cheating, etc is simply not the right thing. If detected, the instructor will take appropriate action as defined in the TAMU rules and regulations for academic dishonesty. If you are aware of dishonest conduct during the course of the semester and you do not report it as such you are just as guilty and the primary offender.
Final Note:
Palisade Corporation has released a new version of the software that is more advanced than what comes with the text. As of the date of this outline, January, 2009, the authors of the book have not finished the new edition that incorporates the revised software. Palisade has agreed to supply the department with a 75 day version of the software that can be downloaded from the class website. More on this during the first week of the course and I will explain all at the first class meetings.
The revised version of the book may not be out until 2010 but the new software is now available.

I wish all you well and work up and past your abilities. Remember, it is your education so invest in it. Your purpose should be to learn. If you are in the class just to make and “A” then you could be disappointed. Work towards learning and let the grade take care of itself.

Important Dates

To be supplied – semester specific

Final Exam Schedule

To be supplied – semester specific
Department of Industrial and Systems Engineering  
ISEN 689: Management of Engineering Systems

This course is intended to teach engineers about the role of people and organizations in the design and development of complex engineered systems and to provide them with the skills needed to effectively manage large-scale system development programs.

COURSE INFORMATION
ISEN 689: Management of Engineering Systems  
Spring 2014, Section 600 (Section 700 for Distance Education), M/W 4:30 - 5:45 pm  
Class Location: Emerging Technologies Building (ETB) Room 1005

TEXTBOOKS
- Additional readings selected from the extensive literature on each of the topics covered

TEACHING STAFF
Dr. Mark S. Avnet – Instructor  
Office: ETB 4075  
Office Hours: Tu 2:00 - 4:00 pm or by appointment  
E-mail: avnet@tamu.edu (Please include “ISEN 689” and your section in the subject line)

PREREQUISITES
- Demonstrated interest in social and organizational aspects of engineering. Relevant professional experience helpful but not required.
- Active eCampus account

Students must abide by the policies and regulations of the Department of Industrial and Systems Engineering and Computer and Information Services of Texas A&M University.

COURSE OBJECTIVES
The student will learn the key principles of leading and managing in systems engineering organizations. The course will provide both the theoretical underpinnings and the practical tools needed to effectively lead and manage technical people engaged in complex engineering efforts. The content will focus on both the “hard” skills (systems engineering life cycle, strategic planning, project selection, organizational structure, decision-making, network scheduling techniques, and financial analysis) and the “soft” skills (effective leadership styles, motivation and psychological type, managing creative people, negotiation, and navigating informal networks). The goal of the course is to equip students with the broad range of knowledge and skills relevant to leading and managing in the complex organizations of the 21st century.
COURSE SCHEDULE
The course is divided into four distinct but interrelated modules: (1) Leading Technical People and Organizations, (2) Managing Engineering Projects, (3) System Development and Life Cycle Management, and (4) Engineering Systems in Business and Society.

<table>
<thead>
<tr>
<th>Module</th>
<th>Date</th>
<th>Week</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Module 1: Leading Technical People and Organizations</strong></td>
<td>1/13</td>
<td>1</td>
<td>Engineering Management: A Systems Perspective</td>
</tr>
<tr>
<td></td>
<td>1/15</td>
<td>1</td>
<td>Formal Organization and Informal Networks</td>
</tr>
<tr>
<td></td>
<td>1/20</td>
<td>2</td>
<td>Holiday - No Class</td>
</tr>
<tr>
<td></td>
<td>1/22</td>
<td>2</td>
<td>Organizational Culture</td>
</tr>
<tr>
<td></td>
<td>1/27</td>
<td>3</td>
<td>Theories and Perspectives on Leadership</td>
</tr>
<tr>
<td></td>
<td>1/29</td>
<td>3</td>
<td>Motivation and Psychological Type</td>
</tr>
<tr>
<td></td>
<td>2/3</td>
<td>4</td>
<td>Managing Engineering Teams</td>
</tr>
<tr>
<td></td>
<td>2/5</td>
<td>4</td>
<td>Negotiation and Conflict Management</td>
</tr>
<tr>
<td></td>
<td>2/10</td>
<td>5</td>
<td>Strategic Planning and Technological Forecasting</td>
</tr>
<tr>
<td></td>
<td>2/12</td>
<td>5</td>
<td>Diffusion of Technology and Product Strategies</td>
</tr>
<tr>
<td></td>
<td>2/17</td>
<td>6</td>
<td>Proposals, Contracts, and Decision-Making</td>
</tr>
<tr>
<td></td>
<td>2/19</td>
<td>6</td>
<td>Real Options in Project Evaluation and Selection</td>
</tr>
<tr>
<td></td>
<td>2/24</td>
<td>7</td>
<td>Project Organization and Control</td>
</tr>
<tr>
<td></td>
<td>2/26</td>
<td>7</td>
<td>Project Planning Tools</td>
</tr>
<tr>
<td></td>
<td>3/3</td>
<td>8</td>
<td>Cost and Schedule Evaluation</td>
</tr>
<tr>
<td></td>
<td>3/5</td>
<td>8</td>
<td>Take-Home Midterm Exam (due by 6 pm)</td>
</tr>
<tr>
<td></td>
<td>3/10</td>
<td>N/A</td>
<td>Spring Break - No Class</td>
</tr>
<tr>
<td></td>
<td>3/12</td>
<td>N/A</td>
<td>Spring Break - No Class</td>
</tr>
<tr>
<td><strong>Module 2: Managing Engineering Projects</strong></td>
<td>3/17</td>
<td>9</td>
<td>Role of Government in Research and Development</td>
</tr>
<tr>
<td></td>
<td>3/19</td>
<td>9</td>
<td>History of Large-Scale System Development Programs</td>
</tr>
<tr>
<td></td>
<td>3/24</td>
<td>10</td>
<td>Systems Engineering: Definition and Life Cycle Phases</td>
</tr>
<tr>
<td></td>
<td>3/26</td>
<td>10</td>
<td>Requirements Definition, Analysis, and Allocation</td>
</tr>
<tr>
<td></td>
<td>3/31</td>
<td>11</td>
<td>Design Reviews and Configuration Management</td>
</tr>
<tr>
<td></td>
<td>4/2</td>
<td>11</td>
<td>System Life Cycle Properties (or &quot;&quot;-ilities&quot;)</td>
</tr>
<tr>
<td></td>
<td>4/7</td>
<td>12</td>
<td>Systems Engineering Tools and Techniques</td>
</tr>
<tr>
<td><strong>Module 4: Engineering Systems in Business and Society</strong></td>
<td>4/16</td>
<td>13</td>
<td>Socio-Technical Systems and Systems-of-Systems</td>
</tr>
<tr>
<td></td>
<td>4/21</td>
<td>14</td>
<td>Student Project Presentations</td>
</tr>
<tr>
<td></td>
<td>4/23</td>
<td>14</td>
<td>Student Project Presentations</td>
</tr>
<tr>
<td></td>
<td>4/28</td>
<td>15</td>
<td>Engineering Systems and Globalization</td>
</tr>
<tr>
<td></td>
<td>5/5</td>
<td>Finals Week</td>
<td>Final Exam (3:30 - 5:30 pm)</td>
</tr>
</tbody>
</table>
EXAMINATIONS
The two exams will cover both the assigned readings and the material presented in class. The exams will consist primarily of problems on specific topics and short essay questions focused on synthesizing concepts covered throughout the semester. The final exam must be taken by all students at the date and time specified by the University. According to the final exam schedule, it will be held on Monday, May 5, 3:30 - 5:30 pm in the regular classroom.

If an examination is missed, you must have a written authorized excuse. If possible, notify the instructor in advance of the evaluation. Otherwise, do so within 2 days of your return to campus. Makeup evaluations will be administered in accordance with University Rules (Rule 7 at student-rules.tamu.edu).

PROJECT
Each student will submit and present a report relating the concepts from the course to his/her own current or intended career. The emphasis of the project will be on applying engineering management principles to actual situations that you are likely to encounter in the real world.

CASE STUDIES
Several individual and team-based case studies will be assigned on a sporadic basis either as homework or as in-class exercises. These case studies are intended to assist you in applying the principles and ideas learned in the course.

GRADING
Exams: 60% of grade
Project: 20% of grade
Case Studies: 20% of grade

Grading Scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>90% - 100%</td>
</tr>
<tr>
<td>B</td>
<td>80% - 89%</td>
</tr>
<tr>
<td>C</td>
<td>70% - 79%</td>
</tr>
<tr>
<td>D</td>
<td>60% - 69%</td>
</tr>
<tr>
<td>F</td>
<td>&lt;60%</td>
</tr>
</tbody>
</table>

The above scale represents the minimum range necessary to achieve each grade, but the actual grades will likely be based on a curve determined by class average and standard deviation.

Important Note on Attendance: Although attendance will not be formally included as part of your final grade, the exams will include certain topics covered only in class. In addition, some team casework will be completed during class time and will be included as part of the grade. As with a job in industry, you will be responsible for all work and all topics discussed regardless of your attendance. If you foresee an unavoidable absence, you are strongly encouraged to discuss it with the instructor in advance.
TEAMS
This course will involve working in teams, primarily on the assigned case studies. The teams will be formed during the first class day of the second week or after the roster is stable (no more add/drops). Teams will be formed by the instructor such that individuals may be working in concert with students that they do not know or do not know well. This policy is intended to prepare you for a basic reality of industry – that you will regularly work in teams not of your choosing. In general, the teams will consist of 4 to 6 individuals.

STUDENTS WITH DISABILITIES
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services (visit http://disability.tamu.edu, call 845-1637, or go to Cain Hall Room B118). If a student has the need for the special services provided by the University, please discuss this privately with the professor the first week of the course.

ACADEMIC INTEGRITY
The Aggie Honor Code states that “An Aggie does not lie, cheat, or steal or tolerate those who do.” Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning and to follow the philosophy and rules of the Honor System. Ignorance of the rules does not exclude any member of the Texas A&M University community from the requirements or the processes of the Honor System. For additional information, please visit: www.tamu.edu/aggiehonor.

STUDENT RULES
The following web site contains specific information pertaining to student conduct and other important issues: http://student-rules.tamu.edu/.