ISEN 689 - Systems Thinking and Analysis

Course Overview

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Office Hours

Instructor
239C Zachry
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Hours:
  MW 1:30 - 3:00 p.m.
  Others by appointment – “open-door policy”.

Teaching Assistant
Eduardo Pérez-Román
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Hours:
  MW 4:30 – 5:30 p.m.
  Others by appointment.
Teaching Assistant’s Responsibilities

- Grade your homework, pop-up quizzes, other class assignments, team projects, presentations, etc.

- Assist in preparing class material (slides, handouts, etc)

Note:
Please be nice to your TA! He is here to help you and will be a good source of information.

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Classroom & Schedule

Lectures
TR 8:00 – 9:15 a.m.

We will do: 8:15 – 9:30 a.m.!

Zachry 301

No lab sessions
Course computer software (IBM Rational Rose) available in ISE Computer Lab (225 & 228) and in Zachry 301.

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Teaching Philosophy

“Experiencing the Joy of Learning”

YOU will be spending a LOT of TIME working on this class, so WE better make it FUN!

Course Evaluation Points:

- **Class Preparation** – you & me: Read your textbook, class-notes, etc
- **Assignments** – exams, homework, quizzes, project, etc
- **Communications** – slides, class-notes, eLearning, etc
- **Responsiveness** – ask questions, dialogue, etc
- **Academic Concern** – I do care that you learn the material
- **Availability** – “Open door policy”, email, phone, etc
- **Fairness in Grading** – The TA and I will grade your work fairly (ask)
- **Environment**: Good learning environment, be professional

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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 dishonesty.

http://www.tamu.edu/aggiehonor

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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.
Textbook & Additional Material

Course Textbook


References


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Grade Distribution

Homework, quizzes, class participation 25%
Team project 25%
Midterm (March 12, Thursday – tentative) 25%
Final Exam (May 11, Monday, 1-3 p.m.) 25%

Grades: A >= 90; B >= 80; C >= 70; D >= 60; F < 60

“In this course, I do not GIVE grades, you EARN your grade!”
# ISEN 689: Topical Outline

## Section I – Basic Concepts (~3 weeks)

1. **Introduction to Systems Engineering** (Kossiakoff, Ch. 1)
   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. 2)
   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 Tools** (Hitchins, Ch. 9)
   3.1 Causal loop/Influence modeling
   3.2 N2 charts
   3.3 Systems of systems
Section II – Systems Modeling and Design (~5 weeks)

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

5. Systems Design Requirements
   5.1 Input/output requirements
   5.2 Technology requirements
   5.3 Performance, cost, and trade-off requirements
   5.4 System test requirements
Section III – Systems Engineering Processes (~5 weeks)

6. Systems engineering tools
   6.1 Overview of IDEF Methods
   6.2 Introduction to object oriented analysis and UML
   6.3 IBM Rational Software Modeler (design assignments)
7. The system development process (Kossiakoff, Ch. 3, 4)
   7.1 System life cycle models (DoD, ISO/IEC, NSPE)
   7.2 Concept development phases
   7.3 Engineering development phases
   7.4 Systems Engineering Documents
8. Formulation of Issues and Constraints (Kossiakoff, Ch. 5, 6, 7)
   8.1 Needs analysis
   8.2 Concept exploration
   8.3 Concept definition
9. Design and Evaluation of Systems Models (Kossiakoff, Ch. 8, 9, 10)
   9.1 Advanced development
   9.2 Engineering design
   9.3 System integration and evaluation
Things to Remember

• This is a systems design & management course
• You are here to learn the concepts/principles
• SE is a “science” as well as an “art”
  – Be CREATIVE
  – Apply COMMON SENSE
  – Be PROFESSIONAL
  – Be KNOWLEDGEABLE
  – Be a LEADER

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Things to Remember While in Class

• Be a good team-mate
• Bring course textbook to class
• Feel free to ask questions in class at any time
• Do not wait to alert me when you see me making a mistake!
• Be considerate of other students and do not make noise
• Please turn-off your cell-phone while in class
  – I reserve the right to answer your phone 😊
• Overall:
  – *Let us work hard and have some fun!*

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Course Outcomes

The instructor expects the following to be student critical factors for a systems engineering education:

A. An ability to formulate, analyze, and interpret issues; issue formulation, analysis, and interpretation, and problem solving and design.
B. An ability to use the techniques, skills, and modern computer engineering tools necessary for engineering practice.
C. Ability to understand knowledge practices, principles and perspectives to enable breadth and depth in a meaningful professional area.
D. Fundamental understanding of all of the foundation areas of general education.
E. An ability to function in multidisciplinary teams.
F. An ability to communicate ideas, verbally and in writing.
G. High professional and ethical standards.
H. Mature, responsible, creative, quality conscious mind.
I. Motivation for and capability of achieving a lifetime of learning.
J. Knowledge of management strategies and human behavior motivations.
K. Appreciation of national and global issues from a variety of perspectives.
Team Projects

1. Design a “complex system” using the SE approach
2. Form teams of 1-3 students by end of Feb
3. Each team will choose their own project based on interest and importance to societal needs, e.g.,
   - Homeland security systems
   - Healthcare delivery systems
   - Energy systems
   - Environment/ecological systems
   - Economy or Business systems
   - Education
   - A system that does not exist today!
4. MS/PhD students are encouraged to choose a project based on their thesis/dissertation, while DL students can choose a problem for their line of work
5. Will develop project towards the semester to reinforce the material covered in class
6. Project report due: Last day of class, May 5
7. Project presentations: Last week of class (if time permits!)
Student Introductions

1. Your real name, nick-name
2. Where you are from
3. Your major and year in school
4. Bachelor’s degree
5. Work/practical project experience
6. Expectations of the course
7. Career goals
8. Joke or interesting fact about yourself