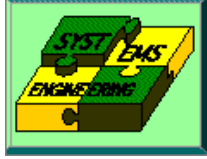
George Mason University



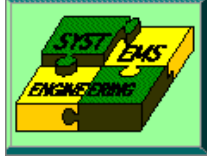
SYST 101: Intro to Systems
Lecture 1:

Jan. 20, 2004

C. Wells, SEOR Dept.

Welcome to SYST 101

- Course Description
  - What is SYST 101?
- Course Procedures
  - Class procedures, website, lectures, homework, exams, projects, teaching assistant
- Instructor Contact Information



What is SYST 101?

- An introduction to systems and systems engineering
  - first systems, then engineering
- How to think about systems and their interactions with their environments
- How to handle competing and often contradictory demands for what a system should do

Announcements

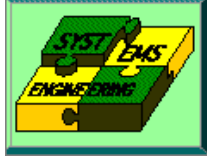
- None

Agenda

- Overview of the course
- Understand “system”, “engineering”, and “system engineering”
- Basic concepts of a system and its environment
- Understand the relevance and use of SYST, OR, and department’s courses in the curriculum
- Differences between systems engineering and other engineering disciplines

Course Material

- Course Website:
  - http://www.gmu.edu/departments/seor/syllabi/04B/SYST101/SYST101.htm
- Two textbooks:
  - Petroski: “To Engineer Is Human”
  - Petroski: “Invention By Design”
- Lectures:
  - Lecture slides are posted to the course website by Lecture
- Projects:
  - Discussed later.



Course Website

- Syllabus: General course info, instructor and TA contact info, office hours, grading system
- Lectures & Assignments: Course lecture slides, homework assignments

Textbooks

- Two textbooks this semester
  - Petroski: “To Engineer Is Human”
  - Petroski: “Invention By Design”
    - Dr. Henry Petroski has written several “non-standard” books on engineering.
- Goal is to get a “feel” for engineering

Reading Assignments

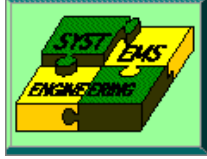
- Reading assignments will be given out of both books
  - Chapter or sections, and a to-be-completed-by date (due date).
  - Pop quizzes may be given in class on the reading assignment on or after the due date.
    - Grades are part of “Exams”
  - *Rationale*: The lectures will be much more meaningful to you if you have already read the textbook section.

Homework Assignments

- Usually due the next class period
- Late homework accepted only by the following class period
  - and only with a good excuse (instructor's call)
- *Rationale*: lots of students, one instructor

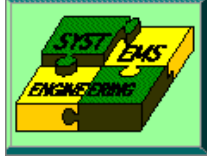
Homework Assignments (cont)

- Neatness counts
  - Staple multiple pages
  - Name and date in upper right corner
- Legible writing
- 8 ½" x 11" paper
- Grammar and spelling
- Give me what I ask for, no more and no less
- *Rationale*: lots of students, one instructor plus you have to learn to communicate precisely



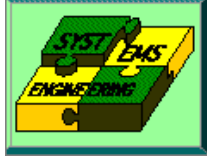
Exams

- Pop Quizzes throughout the semester
- Midterm Exam
  - Covering the 1st half of the semester
- Final Exam
  - Covering the entire semester



Projects

- Lego Mindstorms
- Project details will be presented later in the semester.
- Teams will build Lego Mindstorm robots that will attempt to accomplish certain goals.
  - "Build a system that meets certain requirements"
- Project grade will include oral presentations.



Grading

- Study and note taking can be a group effort
- Homework will be individual effort
- Exams will be open book, open notes
- The project will be a team effort of the group members
- The honor code will be strictly enforced

Grading (cont)

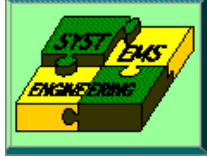
- Homework: 30 %
- Exams: 50% (quizzes + midterm + final)
  - quizzes 10 %
  - midterm 20 %
  - final 20%
- Project: 20%
  - group portion and individual contribution

Grading, what it means

- 10 homework assignments: 3% each
- 2 Quizzes 5% each
- 1 Midterm exam 20%
- 1 Project 20%
- 1 Final 20%
- CONCLUSION: Don't kiss off the homework, be prepared for the quizzes, and participate in the project

Attendance

- Your attendance is expected
  - On time and ready at 3:00
  - Expect class to be over at 4:15
- Attendance will not be taken, but - - -
  - most of the important stuff is in the lectures
- Let me know before hand if you are going to miss a class



Introduction to Systems Engineering

- What is a System?
- What is Engineering?
- What's Systems Engineering?
- Are we having fun yet?

Is this a system?

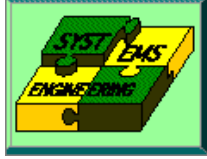
- http://www.sodaplay.com/zoo/index.htm

What is a System?

- Numerous definitions everywhere
- A System is:
  - A set of interacting components that together accomplish some goal or behavior; it exists within an environment, and can interact with that environment.

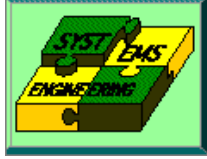
Are These Systems?

- U.S. Interstate Highway Network
- Commercial Air Transportation System
- The Human Body
- Fairfax County Police Dept.
- GMU Registrar
- The population of rabbits and foxes in the wood



Yes

- All the examples are systems.
- All exist within an environment.
- Not all are subject to human engineering.

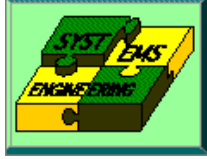


Scope of this Course

- Systems which are designed, developed, deployed or controlled by human engineers.
- Today, software-intensive systems make up a significant fraction of what you will be dealing with in the future.
  - Not only computers and software applications, but aircraft, cars, cell phones, and next year, maybe your toaster.

Key Terms

- Scope of the System
- Mission or Goals
- Requirements
- Stakeholders
- Lifecycle
- Interactions
- Behavior



Scope of the System

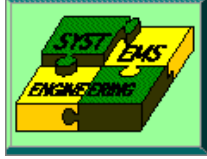
- What is included in your system, and what is not.
- The System's *Boundaries*

Mission or Goals

- What is the system supposed to do?
- How well does it need to do it?
  - Performance
- Criteria for success

Requirements

- Based on the Mission/Goals
- More detail
- Must be clear
- Must be *testable*
  - Someone else should be able to test whether your system satisfies the requirement or not



Stakeholders

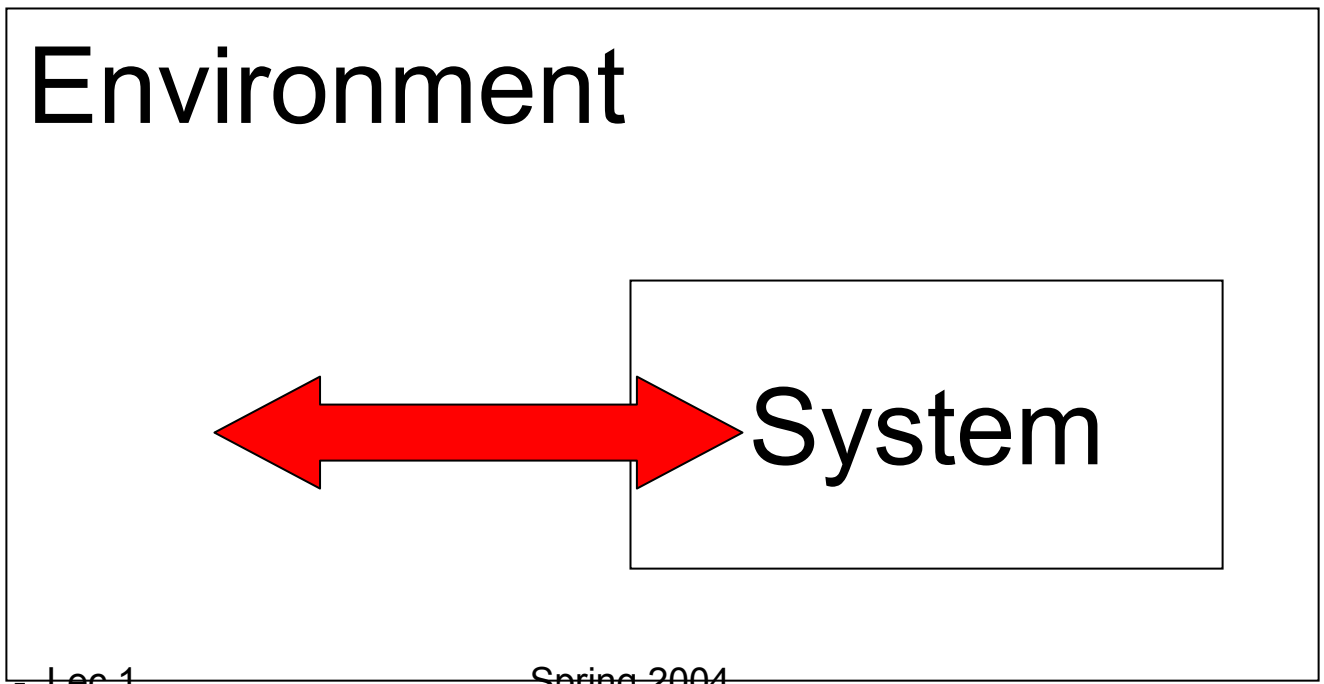
- All of the people or organizations that care about or are impacted by the system.
- Everyone who needs to have input into how the system will function or how it will be used.

Lifecycle

- Systems usually undergo a “life”
  - Starting with initial ideas and concepts
  - Through the design process,
  - Then they’re developed and tested,
  - Deployed in the field or commercial arena,
  - Maintained and operated,
  - Retired and removed from use.
- Examples where Lifecycle problems exist?

Interactions

- Every system interacts with it's environment.



Environment vs Context

- There are things outside of the system that
  - Can affect the system AND
  - Can be affected by the system.
  - This defines the *Environment* of the system.
- There are things outside the system which
  - Can affect the system BUT
  - Cannot be affected by the system.
  - This defines the *Context* of the system

Behavior

- Defines what a system needs to do or does in response to stimuli
- *Stimuli* : Various events, conditions or occurrences that stimulate a reaction in the system.
- Systems are usually purchased for their behavior, not their appearance.

So, Systems Engineering Is:

- Learning the mental processes, tools, and ways of thinking that help you figure out all these aspects.
- Learning to apply these tools in order to develop the best system you can with the resources you have.

Assignments

- Reading
  –
- Homework
  – Send Me an e-mail
    - information to assess class makeup
    - information to assign project teams

e-mail format

to: charles.wells@cox.net

subject: SYST 101 demographics

body

name:

major:

year:

interpersonal skills: (scale 1=low to 5=high, integer values)

artistic expertise: (scale 1=low to 5=high , integer values)

literary expertise: (scale 1=low to 5=high , integer values)

mechanical expertise: (scale 1=low to 5=high , integer values)

computer expertise: (scale 1=low to 5=high , integer values)

math courses: