SYS 681 Dynamic Modeling of Systems and Enterprises

Spring 2023

Prof. Roshanak Nilchiani
Appointments and office hours by Zoom only
Email: rnilchia@stevens.edu

Class time: Mondays 12:00-2:30 PM

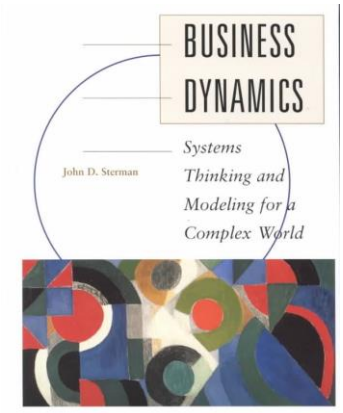
Location: Carnegie 315

Course Overview

System Dynamics is a modeling approach for complex systems and enterprises and was developed at MIT in the 1960s. Today it is used for a wide range of applications ranging from supply chain management, decision modeling, human behavior analysis, innovation management and many other management and engineering applications. In this course we will cover the basic concepts of systems dynamics and learn to build models of contagion systems, innovation diffusion, supply chain models and other complex systems applications.

Course Structure

The course consists of lecture notes and recorded lectures, homework assignments, a mid-term exam, and a final term individual or group project.



Textbook

All the lectures rely on the textbooks and students are expected to have read the assigned sections in preparation for the class.
John Sterman, *Business Dynamics: Systems thinking and modeling for a complex world*. McGraw Hill, 2000

Systems Dynamics Software

We will use the Vensim Software (Free download), which is also available in the CD accompanying the textbook, but you can download the latest version of the educational software using the following link: https://vensim.com/vensim-personal-learning-edition/

Laptop Computers

Students are encouraged install Vensim and begin working with the software after the first 2-3 introductory lectures.

Grading

Assignments	15%
Class participation	5%
Mid-Term Team Exam	30%

Final Term Project (individual or team)	50% (20% for presentation PowerPoint and 30% for final term paper (Word or PDF)

- Assignments are individual.
- The mid-term exam is individual test.
- The final term project is group project (maximum 4 students) and collaboration between students are highly encouraged, unless you have a specific project in mind which you would like to do it individually.
- **Students are expected to abide by the Stevens Honor Code in submitting assignments and projects.**

Course Schedule and Readings

Date	Topic	Book Chapter to read
01/23/2023	**Lecture 1:** Introduction and Overview	*Business Dynamics* [BD], Ch. 1
01/30/2023	**Lecture 2:** Problem articulation and formulating a dynamic hypothesis	BD, Ch. 3, Ch. 4
02/06/2023	**Lecture 3:** Structure and behavior of dynamic systems, stock and flow	BD, Ch. 5 (Skim Sections 5.4, 5.6)
02/13/2023	**Lecture 4:** Dynamics of stock and flow	BD, Ch. 6 (Skim Sections 6.2.7, 6.2.8, 6.2.9, 6.3.4, 6.3.6)
02/20/2023	**President's Day/ No Class**	
02/27/2023	**Lecture 5**: Closing the loop: Dynamics of simple structures with stock and flow	BD, Ch. 7 and 8
03/06/2023	**Lecture 6:** Modeling SARS	
03/13/2023	**Spring Break week**	
03/20/2023	**Midterm Exam**	
03/27/2023	**Lecture 7**: Material and information delay, aging chains	BD, CH. 11 and 12
04/03/2023	**Lecture 8:** Growth dynamics, Diffusion	BD, Ch. 9.1 (Skim 9.1.2, 9.1.3); 9.2,
04/10/2023	**Lecture 9:** Positive feedback and Path dependencies	
04/17/2023	**Session 10:** Working session on final term projects and extra help	
04/24/2023	**Lecture 11:** Ecological and Economic systems sustainability	BD, Ch. 10 (Skim Section 10.2)
05/01/2023	**Session 12:** Review of the course and Final term presentations, part 1	
05/08/2023	**Session 13:** Final term Project presentations, part 2	
05/16/2023	**Final term papers and Presentations are due on Canvas**	