University at Albany, School of Business
BITM 624: Business Dynamics (9591)– Spring 2020 - (3 credits)
Th, 5:45 – 8:35, BB 221

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Course Description
Why do seemingly good strategies fail to produce the desired results? Are problems so complex that we cannot affect outcomes in any meaningful way? Can we learn from success and failure? This course introduces tools and perspectives that will help you with 'wicked problems,' where complexity, constraints, and conflicting pressures are the norm.

This effort covers two related areas – systems thinking (ST) and system dynamics (SD). Systems thinking is an analytic approach that looks for endogenous interactions among elements to explain outcomes. System dynamics uses computer simulation to turn systems thinking ideas into formal models supporting experimentation and hypothesis testing. Employing the techniques of these two areas, we will discover the important role of feedback and structure that drive business growth and failure. We will experiment with strategies that support economic vitality and efficient and effective governance (among other issues) in a time of increasingly scarce resources.

The course includes in-class simulation as well as lectures. Simulation exercises provide group-driven interactive learning. Lectures will include the ideas of systems theory, problem structuring, model building and analysis, and techniques for using models for theory building and testing.

Required Text and Materials
The two books for the course are:

- Sterman, Business Dynamics (2003), McGraw Hill, and
- Meadows, Thinking in Systems (2008), Chelsea Green.

If you purchase a used copy of Sterman, you can download the CD from the course readings page, week 1.

There will be a Harvard Business School case pack, provided by the school, that will require signup. In addition, you will need to purchase access to a set of simulations from SDGamesOnline.net. The cost will be about $20. Purchase instructions will be provided.
There will also be articles and links to videos posted on Blackboard. You will need Internet access for Blackboard, reserve readings, and computer simulations. All readings are required and expected to be completed before the assigned class.

The System Dynamics Society has a great library of materials on practical and academic uses of simulation modeling. Follow them on Facebook and browse the materials at http://systemdynamics.org. There are also social media channels on business, security, economics, and other channels, identified on this website.

We will also work with VENSIM Personal Learning Edition, a simulation software tool. This tool is available in the University user rooms (though it may be a slightly older compatible version), and may also be downloaded for academic use from the vendor's web site: http://vensim.com/free-download/. Choose the PC or MAC versions as you require. The documentation is embedded in software and may also be accessed at http://www.vensim.com/documentation/index.html.

Learning Objectives
By the end of this course you will:

- Learn how to recognize and apply a systems perspective to business and governmental problems;
- Understand possible sources of anticipated and unanticipated effects of organizational decisions and policies;
- Experiment with simulation-based approaches that support the analysis of complexity;
- Develop descriptive and formal models of causal relationships that underlie these problems;
- Recognize how feedback and delays influence on policy and planning outcomes; and
- Recognizing patterns of systems behavior that link seemingly disparate problems

What skills will be gained through this course?
You will be instructed in:

- Tools for communicating causal structure;
- Development of simple (and not so simple) simulation models ;
- Critical thinking and analytic abilities;
- Conceptualization of problematic behaviors in terms of systems models – with feedback, emergent behavior, information and material delays, among other ideas; and
- Techniques for presenting conceptual and formal models to different audiences

Assessment
You will demonstrate your accomplishment of course objectives through:

- Completion of homework assignments (80%). There are 12 assignments in the course. Assignments are graded on a 10 point scale. Please submit assignments (including Word documents, model files, or other requested materials) at the start of class through **Blackboard**.
    - Assignments should be your individual work unless indicated in the instructions.
    - Students will be graded based on their best 9 assignments.
- Final Project (20%)
    - Individually or in pairs, you will develop a systems based project on a topic of your choice. An interim report is due about mid-way through the course, and the final project, again with Word documents, a model file, and other materials, is due at the last meeting of the course. More information on the course project will be provided.
- Instructor's subjective judgment of class participation and engagement (5%)

Policy on Plagiarism and Cheating

This is an intensive course and students are **encouraged** to form study groups. Learn by interacting, suggesting, supporting and challenging one another. Assignments, however, should be developed individually. Plagiarism (copying without citation) or cheating (copying without adding value) will result in a failing grade for the whole course. The following are evidence of plagiarism or cheating:

- Material reproduced from another source without any or adequate citation.
- Nearly-identical answers being turned in by two or more students except where authorized in the syllabus.
- Written answers or solutions that a student cannot logically explain verbally.
- Other evidence of collaboration between students on an in-class or take-home assignment that was intended to reflect individual effort.

Attendance
Students are expected to attend and to participate in each class session.

ITM / PAD 624 Readings and Assignments (as of 23 January 2020)

Class	Date	Topic	System Dynamics Skills	Readings	Assignment (Due at start of class)
1	1/23	Introduction	Practical experience with endogenous vs exogenous perspectives on problem solving. Introduction to causal loops.	None	None
2	1/30	A case study in Systems Thinking	The endogenous point of view. Causal modeling, feedback loops, and stocks and flows. The dynamic approach to strategy. *Model: GORA*	GORA case (on Blackboard) BD §2.1 – 2.3 M, §1-4 Sterman video	A1: Feedback and circular causality exercises. GORA Decision Memo.
3	2/6	Simulation for strategic and policy analysis: Dynamics of the Kaibab deer population.	Mental models and formal models. Models in the articulation and development of strategy. Editing and simulating in Vensim. Drawing conclusions from model-based analyses. *Model: Kaibab*	BD §1, §5.1-5.4 FT §2 (on Blackboard), Kaibab plateau case (on Blackboard) Videos by Fiddaman, "Causal Loop Diagramming (10 min – PLE part only), "Running a simple model", "Building a simple model"	A2: Graphs over time exercises.
4	2/13	Model formulation in Vensim	Understanding simulation and the modeling process. More on Vensim mechanics. Diagrams and equations. DT. Intro to accumulations. Structure of exponential growth & decay. Beginning a *catalog of structures.* *Models: Exponential Growth and Exponential Decay*	BD §3, §4.1 Bane and Ellwood, "Slipping in and out of poverty"	A3: Kaibab analysis
5	2/20	Intro to Urban Dynamics. Formulating simple urban models	Model conceptualization. Structure of compensating Feedback and goal-seeking structures. Nonlinear effects & S-shaped growth. Smooths. Endogenous dynamics. *Models: BSN, POPBSN*	BD §4.2, §4.3 Saeed, "Urban Dynamics"	A4: Spells of Poverty
6	2/27	Completing the urban model. Discussing the dynamic hypothesis.	Compensating feedback. Iterative model building. Refining model conceptualization and the concept of a *dynamic hypothesis.* Problem focus, Problem dynamics, Context,	Richardson, "Foundations" Randers, "Guidelines", Astor, "What problems are you trying to solve?"	A5: A simple urban model

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			Audience, and Purpose. Model boundaries: Temporal, Conceptual and Causal. *Model: URBAN1*		
7	3/5	Project dynamics	Developing a project dynamics model through iteration. *Models: Project1a through Project 1e.*	BD §2.3, §5, §6, ISDM, §2.4, §4.4 M, §5 Video by Cooper; Cooper, "Naval Ship Production", Cooper, "Swords and Plowshares", Godlewski, "SD Transforms PM"	A6: Conceptualization practice exercises and short course project proposal.
8	3/12	Epidemics and diffusion structures. Validation and evaluation of models.	Diffusion structures. Discussion of model evaluation validation. *Model: SIR, Bass*	BD §8, §9 Bass, "Product Growth Model" Forrester, "Tests for Building Confidence" Oreskes, "Validation, Verification and Confirmation"	A7: Fixing a flaw in the project model.
--	3/19	Spring Break			
9	3/26	Oscillations: Backlogs, workforce, and overtime	Structure and dynamics of oscillating systems and systems with fixed and sliding goals. Course Project discussion *Model: Backlog model series*	BD §7	A8: Epidemic modeling and policy simulation.
10	4/2	Market Growth. Nonlinear oscillations. Commodity and market destabilization.	Dynamic capability models. Limit cycles and phase diagrams. *Models: Commodity Model, Market Growth Model*	Morecroft, "Managing Business Growth", BD §4.3, §15.5	A9: Course Project Description
11	4/9	Entrepreneurship and growth	Simulation game for learning about market cycles and resources *Model: People Express Simulation*	People Express HBS Case; People Express Microworld instructions	A10: Inventory /Workforce Oscillations and the origins of Business Cycles
12	4/16	Human Resource Management	Simulation game for learning about system dynamics and corporate policy. *Model: Professional Services Microworld*	McKinsey HBS Case; Professional Services Microworld instructions.	A11: PEX strategic analysis
13	4/23	Sustainability of Businesses	Sustainability. *Model: Fish Banks*	No new readings.	A12: Professional services strategic analysis

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14	4/30	Final Presentations	Student Presentations	No new readings	

Key to readings: BD: *Business Dynamics*, M: Meadows, *Thinking in Systems;* FT: Richardson, *Feedback Thought* (on Blackboard), ISDM: Richardson, *Introduction to System Dynamics Modeling with Dynamo* (on Blackboard).