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.

The course is offered at two credit levels. Students enrolled in ITM624 will receive 3 credits for their work. Students enrolled in PAD624 will complete additional assignments and receive 4 credits for their efforts. This little bit of complexity is needed to meet different graduation requirements. Please be sure you have enrolled in the course that meets your program’s needs before the end of the Add/Drop period.

Required Text and Materials

The two books for the course are:

- Sterman, Business Dynamics (2003), McGraw Hill, and

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

In addition, you will need to purchase access to two online simulations from SDGamesOnline.com. Ordering instructions will be given later in the semester. Finally, there is a course pack from Harvard Business School with two case studies to be prepared for later in the semester. You may purchase it after registering at https://hbsp.harvard.edu/import/563933

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. Check out the Business SIG video channel: https://www.youtube.com/channel/UCoLZxMMvIF7kmkmqF7bJ8DQ

We will also work with VENSIM Personal Learning Edition version 7.2, 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 (60%). 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.
  - Students registered in ITM624 will be graded based on their best 7 assignments.
  - Students registered in PAD624 and will be graded based on their best 10 assignments.
  - Late assignments are not accepted except as required by University regulations.
- Final Project (40%)
  - 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.
- 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.
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>System Dynamics Skills</th>
<th>Readings</th>
<th>Assignment (Due at start of class)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8/27</td>
<td>Introduction</td>
<td>Practical experience with endogenous vs exogenous perspectives on problem solving. Introduction to causal loops.</td>
<td>None</td>
<td>None</td>
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<tr>
<td>2</td>
<td>9/3</td>
<td>NO CLASS</td>
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<tr>
<td>3</td>
<td>9/10</td>
<td>NO CLASS</td>
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<tr>
<td>4</td>
<td>9/17</td>
<td>A case study in Systems Thinking</td>
<td>The endogenous point of view. Causal modeling, feedback loops, and stocks and flows. The dynamic approach to strategy.</td>
<td>GORA case (on Blackboard) BD §2.1 – 2.3 M, §1-4</td>
<td>A1: Feedback and circular causality exercises. Prepare a one-page answer the questions at the end of the GORA case for discussion.</td>
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<td>Week</td>
<td>Date</td>
<td>Topic</td>
<td>Assignments</td>
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<td>9</td>
<td>10/22</td>
<td>Project dynamics</td>
<td>Developing a project dynamics model through iteration. <strong>Model: Project 1a through Project 1e.</strong> 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.</td>
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<td>13</td>
<td>11/19</td>
<td>Entrepreneurship and growth</td>
<td>Simulation game for learning about market cycles and resources <strong>Model: People Express Simulation</strong> People Express Case; People Express Microworld instructions A10: Inventory/Workforce Oscillations and the origins of Business Cycles</td>
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<td>14</td>
<td>11/26</td>
<td>Human Resource Management</td>
<td>Simulation game for learning about system dynamics and corporate policy. <strong>Model: Professional Services Microworld</strong> McKinsey Case; Professional Services Microworld instructions A11: PEX strategic analysis</td>
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<td>16</td>
<td>12/10</td>
<td>Student presentations; Course wrap-up</td>
<td>No new readings. Final project due at start of class</td>
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**ITM / PAD 624 Readings and Assignments (as of 27 August)**
Special Activities: UAlbany – MIT - WPI PhD Colloquium, TBD. All are invited.