

PUBP 711: Rational Choice and Uncertainty: Modeling Judgement (3:3:0)

DRAFT

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Rational Choice and Uncertainty: Modeling Judgement introduces the basics of decision support and analysis. It examines dynamic simulation modeling in support of judgement to aid evaluation of perplexing or controversial options involving conflicting objectives or outcomes. The course also covers assessing uncertainty about events and quantities, directly and indirectly; changing uncertainty in the light of new evidence; gathering information before making a decision. The focus of the course is on the support that can be provided by relatively simple models to policy- and decision-making in dynamic and changing environments.

Nature of the Course

The *Rational Choice and Uncertainty: Modeling Judgement* course will provide its students with unique hands-on experience in the development and use of computer-based models to study policy- and decision-making in changing and uncertain environments. The STELLA™ software system will be used in the course. Ready access to a PC or Macintosh computer capable of running the STELLA™ software is essential. Programming in STELLA™ involves drawing diagrams by dragging and dropping icons in a working area and then providing information based on a series of computer-generated questions. An extensive hands-on introduction to that method of programming will be provided at the start of the course.

The role of dynamic modeling to support policy- and decision-making will be discussed and demonstrated with the aid of relatively simple computer models developed and demonstrated by the course faculty. Case studies in the following areas will be undertaken.

1. Diseases, Public Health, and the Response to Bioterrorism.
2. Peace Operations, Refugees, and Disarmament.
3. International Commerce and Ecosystem and Natural Resource Management.
4. International Trade, Transport, and Supply Networks.

Those case studies will involve an introductory use of software developed by the course faculty and subsequent modification and use of that software to undertake independent investigations.

The major feature of the course will be the undertaking of an independent research project in a topic area of the student's choice. The project may be based on work undertaken during the case studies. Course students will write and discuss their project proposals in class. Results of the independent project work will be written in a Project Report and presented to the complete class as a brief verbal report.

Schedule of Activities

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- Seminar 1 (J20): Dynamic Models Can Provide Significant Advantages to Policy Makers.
A detailed overview of the course will be followed by a discussion of the nature of dynamic models and how such models can support policy- and decision-making in dynamic and uncertain environments.
- Seminar 2 (J27): Simple Building Blocks for Constructing Dynamic Models (1).
A series of relatively simple building blocks for constructing systems-dynamics programs will be presented and discussed with the aid of computer models built by the course faculty. Combinations of simple building blocks can be used to construct models of more elaborate systems that could support policy- and decision-making.
- Seminar 3 (F3): More Advanced Building Blocks for Constructing Dynamic Models (2)
More advanced systems-dynamics building blocks and their use to construct policy- and decision-making support facilities will be presented and discussed with the aid of computer models built by the course faculty.
- Seminar 4 (F10): Challenges of Public Policy Making in Dynamic Environments.
The nature of policy- and decision-making in dynamic environments will be discussed with the aid of computer models developed by the course faculty.
- Seminar 5 (F17): Case Study I — Diseases, Public Health, and the Response to Bioterrorism.
Extensive hands-on use and possible modification of disease, public health, and responses to bioterrorism models to support policy- and decision-making developed by the course faculty. The students will write a short Case Study report based on their work.
- Seminar 6 (F24): Case Study II — Peace Operations, Refugees, and Disarmament.
Extensive hands-on use and possible modification of peace operations, refugees, and disarmament models to support policy- and decision-making developed by the course faculty. The students will write a short Case Study report based on their work.
- Seminar 7 (M2): Case Study III — International Commerce and Ecosystem and Natural Resource Management.
Extensive hands-on use and possible modification of international commerce and ecosystem and natural resource management models to support policy- and decision-making developed by the course faculty. The students will write a short Case Study report based on their work.
- Seminar 8 (M16): Case Study IV — International Trade, Transport, and Supply Networks:
Extensive hands-on use and possible modification of international trade, transport, and supply network models to support policy- and decision-making developed by the course faculty. The students will write a short Case Study report based on their work.

- Seminar 9 (M23): Independent Project Proposals.
Presentation of verbal and written proposals for independent research projects to be undertaken by the course participants.
- Seminar 10 (M30): Independent Project Activities (1).
Use of systems dynamics-based software to construct models.
- Seminar 11 (A6): Independent Project Activities (2).
Use of systems dynamics-based software to construct models.
- Seminar 12 (A13): Independent Project Activities (3).
Use of systems dynamics-based software to construct models.
- Seminar 13 (A20): Independent Project Reports and Discussions.
Project reports will describe the development and use of systems dynamics models for policy- and decision-making of particular interest to the course students. Project results will be presented in written and verbal reports.
- Seminar 14 (A27): Using Modeling to Support Future Policy- and Decision-Making Activities in Dynamic and Uncertain Environments.
Summary and review of the overall course activity will identify how systems dynamics modeling can generate a deeper understanding of policy- and decision-making in dynamic and uncertain environments and could support future studies by students and professors alike.

Course Evaluation

Course evaluation will be based on student performance in the following activities:

1. A Written Paper on the nature and challenges of policy-making in dynamic environments on a topic to be selected by the student with the agreement of the course faculty (20% of the total grade).
2. Reports on the four Case Studies to be undertaken during the course (20% of the total grade, that is 5% per Case Study Report).
3. The Project Proposal for the individual projects to be undertaken by the students and general level of participation in the overall course activities (10% of the total grade).
4. Project Report and Seminar Presentation of results obtained during the independent project (50% of the total grade).

Course Texts and Research Articles

Anderson, James E., 2003. *Public Policymaking — An Introduction*. Fifth Edition. Boston: Houghton Mifflin Company.

Richmond, Barry, 2001. *An Introduction to Systems Thinking* (includes a CD-ROM of the STELLA™ Applications Software to be used in the course). Hanover, New Hampshire: High Performance Systems Inc.

Giovacino, Monica and Neil Carey, 2001. *Modeling the Consequences of Bioterrorism Response*. *Military Medicine*, 166(11) p. 925-930.

Jensen, Eva and Berndt Brehmer, 2003. *Understanding and Control of a Simple Dynamical System*. *Systems Dynamics Review*. 19(2). pp. 119-137.

Pauly, Daniel, et al., 2003. *The Future for Fisheries*. *Science*, 302. pp. 1359-1361.

Percival, Valerie, 1997. *Environmental Scarcity and Violent Conflict: Case Studies of South Africa and Rwanda*. In: Morrison, Alex, Stephanie A. Blair, and Dale Anderson (eds.). *Refugees, Resources, and Resoluteness*. Cornwallis Park, Canada: The Canadian Peacekeeping Press, pp. 17-48.

Stocking, M. A., 2003. *Tropical Soils and Food Security*. *Science*, 302. pp. 1356-1359.

Woodcock, Alexander E.R., 2004 (In Press). *On The Dynamics of Societal Processes*. In: Woodcock, Alexander and David Davis (eds.). *Analysis for Governance and Stability*. Cornwallis Park, Nova Scotia: The Canadian Peacekeeping Press.

In addition, several [relatively short!] research articles on international trade and commerce and transport systems will be assigned at the start of the course.

Please Note:

1. The Anderson and Richmond texts are required for the course. Scientific research articles are also required reading and those materials will be made available through the GMU Library, or from the course faculty, as appropriate.
2. Selected software models developed to support the course, mentioned above, will be made available in CD-ROM format during the course by the faculty.