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DEPARTMENT OF
GEOGRAPHY AND PLANNING

GPHY 819: Systems Modelling

Contact Time	3 hours/week	
Format	Lecture/discussion	
Class Assessment (potential)	Model comparison presentation: 15% Assignments/tutorials: 15% Proposal/proposal presentation: 10% Reading summaries and questions: 10% Final project presentation: 15% Individual modelling project paper: 30% Participation in project updates and class discussions: 5%	

COURSE OVERVIEW

To understand the dynamics of complex systems, researchers need to understand complex interactions and feedbacks in the system, e.g. between biological factors and physical factors such as temperature and moisture. To facilitate our understanding of dynamic systems, simulation models can help organize our thinking about system interactions, point to critical knowledge gaps, and test key hypotheses when field experimentation is not possible. Without models, researchers are often left speculating about causality in their own research. This course will take students through the process of developing, testing, and verifying system models. It will start by introducing students to the philosophy of modeling and systems thinking, and different types of modeling approaches. We will then explore, using the literature, various modeling approaches involving systems of interest to the students and/or online versions of various models. Throughout the course, the students will develop their own model, ideally one directed towards their own research. This is NOT a requirement, however, and students do not have to have comprehensive data of their own to take this course. The students will learn how to use the modeling software STELLA (developed by ***isee* systems**), and to utilize the software to analyze their models (including uncertainty analysis and model verification).

LEARNING OUTCOMES

- Enhanced awareness of systems thinking, and how it can benefit research
- Knowledge of systems modeling approach, including all he different components of systems models and how they might differ from other types of models
- Understanding of the modeling software STELLA, including how it can be used to model
testing and verification
- Improved understanding of student's research topic, and how systems thinking can be used to help define research questions and develop (and evaluate) alternative hypotheses

COURSE TOPICS

Systems analysis, model development, model verification, evaluation of modeling approaches

COURSE READINGS

Grant, W.E., E.K. Pedersen, and S.L. Marin. Ecology and Natural Resource Management: Ssytems Analysis and Simulation. John Wiley and Sons, Inc. New York, NY. 373 pp.

Richmond, B. 2005. An Introduction to Systems Thinking. Isee Systems. 165 pp

Fisher, D.M. 2005. Modeling Dynamic Systems: Lessons for a First Course.