SOM 825 – Management Science Seminar: Advances in Variational Inequalities, Game Theory, and Applications

Spring 2017

Class Time: Tuesdays: 1:00-3:45PM
Classroom: ISOM Room G11

Instructor: Dr. Anna Nagurney
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Office Hours: Tuesdays: 10:30-11:30AM; Thursdays: 11:00AM-noon, and by appointment

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Course Description:

This semester this seminar course will focus on advances in variational inequalities, game theory, and applications. The course will begin with an overview recalling the foundations of variational inequality theory and its relationship to optimization. Background on game theory, emphasizing noncooperative games and Nash equilibrium, will then be presented. Of special relevance will be applications that are driving innovations in variational inequalities and game theory and their utilization.

In addition to Nash equilibrium problems and their formulation as variational inequality problems, we will also discuss cooperative games through Nash bargaining theory; Generalized Nash equilibrium problems in which the feasible set of a decision-maker depends not only on its own strategies, but also on those of the other decision-makers – such problems are usually formulated as quasi-variational inequalities -- as well as variational equilibrium problems. We will cover both Cournot and Bertrand strategies in this seminar. In addition, we will demonstrate game theory models with nonlinear constraints and the relevant applications and also describe some stochastic models. Also, if time permits, we may cover alternative variational inequality formulations along with Lagrangean

analysis.

The applications that will be covered, along with the qualitative analysis, and computational procedures, include: competitive fresh produce supply chains (both long and short ones); multitiered supply chain networks with suppliers and performance assessment and importance indicators; cybercrime and cybersecurity and relevance to supply chains; competitive disaster relief supply chains; competition for blood donations, as well as supply chain competition for capacity.

The students will be provided with links to the papers that the lectures are based on or hardcopies, if online versions are not available, and are responsible for having read them in a timely manner.

One of the goals of this seminar is to support the research of the students in it in terms of pushing the frontiers of their research in the modeling of complex decision-making behaviors in a variety of supply chain network problems, along with their solution. It is recognized that different students may have different backgrounds.

All of the course lectures and the syllabus are posted on the course website at: https://supernet.isenberg.umass.edu/courses/SCH-MGMT825-Spring2017.html
This page will be updated as the seminar progresses. It also contains links to additional foundational lecture materials.

Outline of Seminar Topics

Variational inequality theory fundamentals

Game theory

Fresh produce supply chains

Supply chain performance assessment

Cybercrime and cybersecurity

Disaster relief supply chains

Innovations in blood supply chains

Capacity competition in supply chains

Supply chain competition in time-sensitive markets.

Requirements

Each student will first present research that he/she has already completed that is relevant to the seminar. Each student will be responsible for two additional in-class presentations describing the research project, approved

by the instructor, and the relevant literature, along with progress, plus the final presentation on the student's project paper.

Grading

Class participation:	**20%**
3 in class presentations	**30%**
Research project paper and presentation:	**50%**