

# **Intro to Systems Optimization**



**John Vande Vate**

# Our Focus Broadly



- **Application** of mathematical analysis to the design and analysis of **systems** through the intermediary of abstract **models**.

# Who am I?



## ■ John Vande Vate

- ▶ PhD from MIT
- ▶ Professor in School of Industrial & Sys. Eng at Georgia Institute of Technology
- ▶ President of TechLogistics™, LLC
- ▶ Executive Director of EMIL (Executive Master's in International Logistics)

# Teaching Experience



- Georgia Tech
  - ▶ ISyE: BS, MS, PhD and Executive
  - ▶ Mgmt: Executive
- MIT
  - ▶ This course last year: Everyone got out alive!
- CMU
  - ▶ MBA
- Shanghai Institute of Mechanical Engineering
  - ▶ MBA

# Industrial Experience

## ■ Over 20 years

### ▶ Worked with J.F. Shapiro through grad school

- Bank of Boston
- International Paper
- Unilever
- ...

### ▶ Independent consulting

- Ford
- SmithKline Beecham
- Wyeth Ayerst Labs
- RockTenn
- Burger King
- Milliken
- Sabre
- Scientific Atlanta
- ...

# Course Organization



- Pedagogical Axis
  - ▶ Networks
  - ▶ Linear Programming
  - ▶ Integer Programming
  - ▶ Non-Linear Programming
  - ▶ Heuristics
- Increasing complexity
- Increasing power

# Course Organization



## ■ Tools & Texts Axis

### ▶ Excel Solver & Eppen et al.

- Familiar medium
- Firm foundation

### ▶ AMPL & Fourer et al.

- Industrial standard
- Real potential

# Course Schedule



- Start with Mini Course on Networks
  - ▶ Structured special class
  - ▶ Easy to visualize
  - ▶ Illustrate General Concepts
    - Solution techniques
    - Sensitivity analysis
  - ▶ Intuitive development in higher dimensions
  - ▶ Methods in texts are misleading too



# Group Work



- Teams of 4 or 5
- Every team must include BOTH on-campus and off-campus participants
- Teams work on
  - ▶ Course Project
  - ▶ Challenge Topics

# Challenge Topics

- Network Modeling Challenge:  
Extraterrestrial Optimization
- LP Modeling Challenge:  
Financial Optimization
- IP Modeling Challenge:  
Smelly Optimization
- Modeling Challenge IV: TBA

# Grades



■ Exam 1	25%
■ Exam 2 (Final)	25%
■ Challenges:	25%
■ Course Project:	25%

# Install Solver Add-In

- Tools | Add-Ins
  - ▶ Select Solver Add-in
- May require installing components
- Method 1
  - ▶ With install cd
- Method 2
  - ▶ Copy solver.xla and solver32.dll to  
.. \Microsoft Office\Office\Library\Solver\

# Install Premium Solver



- Must have Solver installed
- CD that accompanies Moore et al.
- \html\PremiumSolver
- execute PremSolv.EXE
- Not absolutely necessary, but recommended.

# Bring your laptop to class



- We will do lots of hands-on modeling
- Thursday:
  - ▶ 01AssignmentModel.xls
  - ▶ 02TransportationModel.xls