TECHNIQUES FOR ENGINEERING DECISIONS Spring 2018 COURSE

Course Title:	Techniques for Engineering Decisions
Course Number:	ECE 307
CRN:	39322
Time:	9:30 a.m. – 10:50 a.m., Tuesdays and Thursdays
Location:	3015 ECEB
Credit:	3 hours (4 hours possible with additional work)
Pre-requisites:	ECE 210
Co-requisites:	ECE 313 or equivalent
Instructor:	George Gross, 244–6346; <u>gross@illinois.edu</u> ; ECEB
Office hours:	Tuesdays and Thursdays 11:00 a.m. – 12:00 noon
TA: Office hours:	Adriano Abrantes; adriano2@illinois.edu Tuesdays 4:00 – 6:00 p.m. ECEB 5034
Catalogue Description:	The course is concerned with the modeling of decisions in engineering work and the analysis of models to develop a systematic approach to making decisions. The course aims to teach students to think structurally about decision-making problems. Fundamental concepts in linear and dynamic programming, probability theory and statistics serve as the mathematical basis for the development of techniques for solving typical problems faced in making engineering decisions in industry and government. Topics include resource allocation, logistics, scheduling, sequential decision making, facility siting, investment decisions, application of financial derivatives and other problems for decision making under uncertainty. Extensive use of case studies from actual industrial applications gets the students involved in real- world decisions. Two projects provide students with experience working in teams and require formal oral presentations and written reports.

ECE 307: TECHNIQUES FOR ENGINEERING DECISIONS

Topical outline:

- Introduction: nature of engineering decisions; structuring of decisions; role of models; interplay of economics and technical/engineering considerations; decision making under certainty and uncertainty; good decisions vs. good outcomes; tools
- Resource allocation decision making using the linear programming framework: problem formulation; basic approach; duality; economic interpretation; sensitivity analysis; interpretation of results
- Scheduling and assignment decisions using network flow concepts: transshipment problem formulation and solution; application to matching decisions; network optimization; scheduling applications
- Sequential decision making in a dynamic programming framework: nature of dynamic programming approach; problem formulation; solution procedures; key limitations
- Probability theory review: random variables; probability distributions; expectation; conditional probability; moments; convolution
- _ Statistical concepts: data analysis; statistical measures; estimation
- Application of probabilistic concepts to the modeling of uncertainty in decision making: modeling of the impacts of uncertainty; applications to siting, investment and price volatility problems
- Decision making under uncertainty: decision trees; value of information; uses of data; sensitivity analysis and statistics
- _ Two distinct case study projects: preparation and presentation by teams
- _ Midterm (mid-late March) and final exams
- **_** Required texts:

A. Ravindran, D. T. Phillips and J. J. Solberg, "*Operations Research: Principles and Practice*," J. Wiley, New York, 1992. Note: available in soft cover

R. T. Clemen, *"Making Hard Decision: An Introduction to Decision Analysis,"* Duxbury Press/Wadsworth Publishing Company, second edition, 1995.

Proposed Grading:

15%
10%
25%
50%

Final exam scheduled on Friday, May 11, 2018, at 8:00 – 11:00 a.m. in ECEB 3015.