



Engineering and Technology Management

COURSE SYLLABUS

Course Number: E M 545

Course Name: Technical Decision Analysis

Instructor: Alice Squires

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Semester Credits: 3

Prerequisites: E M 503 or equivalent stat class

Course Description and Objectives:

This course provides methods and tools for decision analysis. Individuals and organizations make decisions every day. Almost all decisions involve some uncertainty about the outcomes of the decisions and future conditions. Most people handle this uncertainty in intuitive ways. Research has confirmed that intuition is miserably unreliable in assessing the influence of this uncertainty on the outcomes of current decisions. Decision analysis provides a structured discipline for describing, analyzing, and finalizing decisions involving uncertainty. Attributes of decision analysis such as quality decision-making, handling uncertainty, information gathering and relevance, expected value, value measures, risk attitudes, sensitivity analysis, decision diagrams, probability, utility, preference, certain equivalents, dominance, multiple attributes, disparate beliefs, and ethics will be addressed. Topics in organizational and large group decision-making will also be covered. Students will gain mastery in achieving clarity of action and identifying quality decisions in a complex environment. Instructional methods will consist of lectures with interactive student participation, video presentations, guided online discussions, Homework Problems/Review with quizzes and a Final exam, student Team projects in the form of a paper and presentation.

After taking this course, the student will be able to:

- Identify relevant factors for making high quality decisions.
- Distinguish decision quality from event outcome.
- Identify and gather relevant information for making the decision.
- Frame and structure a decision for analysis given uncertainty.
- Communicate the applied decision process using decision diagrams.
- Compute the value of perfect or imperfect information.
- Characterize decisions with influences, probability distributions, expected value, utility curves, risk attitudes, and preferences.
- Apply sensitivity analysis to build a requisite decision model.
- Calculate certain (also known as certainty) equivalent.
- Analyze multi-attribute decision problems with uncertainty.
- Understand the analytical hierarchy process.
- Consider the role of ethics in decision analysis.

Course Topics:

- Introduction to Decision Analysis
 - Quality Decision Making
 - The Decision Analysis Cycle
 - Decisions and Ethics
- Modeling Decisions
 - Elements of Decisions
 - Structuring Decisions
 - Making Choices
 - Sensitivity Analysis
 - Organizational Decision Making
- Modeling Uncertainty
 - Probability basics
 - Subjective probability
 - Theoretical probability models
 - Using data
 - Solving Decision Problems by Simulation
 - Value of perfect and imperfect information
 - Real options
- Modeling Preferences
 - Risk Attitude
 - Utility Axioms, Paradoxes, and Implications
 - Analytic Hierarchy Process
 - Conflicting Objectives

Grading:

Participation: 10%, Discussion: 10%, HW Quizzes: 30%, Team project: 25%, Final Project: 25%