GW | Business

COURSE NUMBER-TITLE	**DNSC 6306 - Decision Models** (1.5 credits)
INSTRUCTOR	Dr. Philippe Delquié Department of Decision Sciences *Office*: Funger Hall #407 *Telephone*: 202 994 7512 *e-mail*: delquie@gwu.edu *Office hours*: on-line, 12-1pm on Fridays and by appointment
COURSE DESCRIPTION	This course introduces analytical models for decision-making, which are often referred to as "Prescriptive Analytics". Decision models have a surprisingly wide range of business applications, across many sectors and industries, from operations management to finance, to marketing, human resources planning, policy analysis and strategic planning, and more. In decision modeling, we seek to describe the essential structure of a case in terms of objectives, decision variables, uncertainties, outcomes, constraints/feasibility, and choice criteria/preferences. The associated computational tools covered are: Constrained Optimization (linear and non-linear), for decision under certainty; and Decision Tree analysis, for decision under uncertainty. Sensitivity and robustness analysis will be used to deal with the ambiguities inevitably present in real situations.
LEARNING OBJECTIVES	Students completing this course should:

- Grasp the scope of business problems that can be addressed with decision models;
- Acquire the "nuts and bolts" for designing decision models;
- Master standard software tools for optimization;
- Know the merits of alternative criteria for decision making, and how to use these criteria;
- Know how to interpret model results and derive actionable insights;
- Be able to articulate the rationale underlying a decision policy.

CLASS MATERIAL AND HOMEWORK

All class material, including lecture slides, reading articles, practice exercises, cases, data files, software tools and tutorials, Excel model solutions, and links to other resources will be posted on Blackboard. The work to do in preparation for each session, as well as assignments due, will be indicated on Blackboard. For each session, you should inspect the Blackboard page at least once *before* class: to check for class preparation instructions and material; and then again *after* class: to review follow-up or updated documents for that session, such as exercise solutions or class notes.

Practice exercises, provided in all sessions, will be the main vector of learning in the course. Therefore, it is essential that you work on these exercises, which will be debriefed and discussed in class. Although the practice exercises will not be graded, you are expected to have prepared them for class as instructed on Blackboard.

SOFTWARE TOOLS AND COMPUTER USE

MS Excel will be used as a platform for decision modeling in this course. Therefore, basic familiarity with Excel is required in this course. As a GW student, you can get a free, full version of Microsoft Office 365 at: https://it.gwu.edu/software.

We will augment Excel with "add-in" tools specialized for decision modeling. Full instructions regarding software use will be provided as we progress through the course.

The use of personal computing devices is allowed in class solely for course-related activities, *not* for multitasking.

TEXTBOOKS

The material provided in the course will be self-sufficient; no textbook is required. Supplementary, optional references on various topics will be suggested.

GRADING

Course grades will be based on
- Two individual assignments (25% each): 50%
- One team assignment (work groups will be formed randomly): 35%
- Class participation: 15%

Full details about the deliverables (format, due dates, etc.) will be specified with each assignment. All assignments will have to be submitted electronically on Blackboard.

To avoid grade inflation, final course grades will be assigned in accordance with the prevailing GWSB guidelines for grade distributions.

ACADEMIC INTEGRITY

All students in the course are expected to fully adhere to the GW University's Code of Academic Integrity. Violations of the code entail substantial risks.

DISABILITY SUPPORT SERVICES

If you need disability accommodations, please register with Disability Support Services (DSS) at disabilitysupport.gwu.edu/registration. If you have questions about disability accommodations, contact DSS at 202-994-8250 or dss@gwu.edu or visit them in person in Rome Hall, Suite 102.

COURSE OUTLINE

Note: *All preparation material and assignments will be posted on Blackboard*

SESSION	TOPICS	READING/PREPARATION
Session 1	**Course Introduction.** Decision Models in the Business Analytics value chain; Building blocks of Decision Models for Prescriptive Analytics. Decision: under Certainty vs. Uncertainty	Practice exercises
Session 2	**Constrained Optimization** Setting up an optimization model: Decision Variables, Constraints, Objective. The case of Lineal models.	*Solver Tutorial* Practice exercises
Session 3	**Sensitivity Data Interpretation:** How robust or meaningful is my solution? Managerial insights into trade-offs among resources (What-if analysis with Shadow Prices and Reduced Costs).	Practice exercises
Session 4	**Integer Optimization and Non-linear Optimization** Applications to portfolio selection.	Practice exercises
Session 5	**Decision Tree** models to analyze decisions under uncertainty. Which risks to accept, avoid, or mitigate? Structuring a decision tree: Decisions, Events, and Consequences; the Expected Value criterion. The best strategy is *not* the sum of best decisions.	*TreePlan Tutorial* Practice exercises
Session 6	**Profiting from Uncertainty with Options and Information.** How information (Perfect and Imperfect) and real options create value; Optimal information acquisition; Bayesian reasoning.	Practice exercises
Session 7	**Using Risk-Tolerance in Decision Trees:** when EV will not give you the right answer: the Expected Utility criterion; Risk Aversion/Tolerance; Certainty Equivalents; Pricing Risks; Measuring Risk Tolerance. **Course Review.**	*Tutorial: using Risk Tolerance in Decision Trees.* Practice exercises