EMBA630: Data, Models, & Decisions
Syllabus

PRE-REQUISITES
This course is restricted to participants in the Executive MBA program conducted by the Robert H. Smith School of Business.

COURSE OVERVIEW
In the modern corporation, all non-trivial managerial decisions need to be logically and empirically substantiated. The logical substantiation is in the form of demonstrating whether, why and how the chosen course of action is superior to all alternative courses. The empirical substantiation is in the form of demonstrating whether, why and how the chosen decision is consonant with data gathered from past experience. Data Models and Decisions introduces participants to analytical techniques that establish the optimality of managerial decisions via empirical (“data models”) and logical (“decision modeling”) means.

The course may be viewed as consisting of two integrated parts. In the first part, we study various methods of analyzing data including regression analysis. In the second part, we consider models for making optimal decisions in situations characterized by either an absence of uncertainty or where the uncertainty arises from non-competitive sources. Techniques here include optimization models, decision trees, and simulation.

As a result of recent developments in IT, many analytical techniques that were once available only as expensive specialized software are now available in a user-friendly spreadsheet environment. Consequently, we will demonstrate the use of all techniques in this course in a spreadsheet environment.

COURSE OBJECTIVES
• To enable you to analyze hard data in order to arrive at managerial decisions.
• To enable you to analyze complex decision problems using structured techniques.
• To equip you with some basic tools for analyzing strategic decision problems.
• To familiarize you with simple yet powerful spreadsheet methods.
• To enable you to decide when to use which technique.
• To enable you to become a smart and skeptical consumer of business analytics, and to enable you to interact with expert personnel specializing in business analytics.
INSTRUCTOR

S. “Raghu” Raghavan is Professor of Management Science & Operations Management at the Robert H. Smith School of Business, University of Maryland, with a joint appointment with the Institute for Systems Research. He joined the Smith School in 1998 after several years in the telecommunications industry. He enjoys teaching decision modeling oriented courses, and has been awarded top 15% teaching awards and the Legg-Mason Teaching Innovation award at the Smith School. He has published on a wide variety of topics (including telecommunications, electronic markets, and data mining) and numerous academic outlets such as Management Science, Operations Research, Decision Support Systems, and the INFORMS Journal on Computing. He holds two patents, and has won numerous awards for his work. These include (i) the Dantzig award for the best doctoral dissertation, (ii) the INFORMS Computing Society Prize (twice); once for innovative contributions to the field of data mining, and a second time for his contributions to public sector auction design, (iii) the Management Science Strategic Innovation Prize from the European Operations Research Society for his research contributions applying optimization techniques to telecommunications problems (iv) the Glover-Klingman Prize for the best paper in the journal Networks, (v) INFORMS Telecommunications Prize for the best paper in the field of Telecommunications, (vi) 2nd Prize in the INFORMS Junior Faculty Paper Competition, (vii) Finalist for the European Operations Research Society Excellence in Practice Award, and (viii) Finalist for the Wagner Prize for Excellence in Operations Research Practice. He has edited six books titled Telecommunications Network Design and Management (Kluwer Academic Press 2003), Telecommunications Planning: Innovations in Pricing, Network Design, and Management (Springer 2006), The Next Wave in Computing, Optimization, and Decision Technologies (Springer 2005), Telecommunications Modeling, Policy, and Technology (Springer 2008), The Vehicle Routing Problem: Latest Advances and New Challenges (Springer 2008), and Tutorials in Operations Research (INFORMS 2008). Dr. Raghavan obtained his Ph.D. in Operations Research from the Massachusetts Institute of Technology.

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TEXT

The required text for the course is:

- In addition we will discuss chapters of *The Analytics Edge* by Dimitris Bertsimas, Allison O’Hair, and William Pulleyblank, Dynamic Ideas, 2016, and
- *Additional handouts will be provided in each class.*

We will use the student version of the DecisionTools Suite software by Palisade which is essentially a set of Excel add-ins that allow us to implement various analytical techniques seen in the course (see [http://www.palisade.com/academic/](http://www.palisade.com/academic/) for more information). We
will only use two components of this package. PrecisionTree, and @Risk. You should have been provided a license code and installation instructions by the EMBA office. Please install the software prior to the first session on August 4, 2016. We will use PrecisionTree in that session. DO NOT INSTALL OR USE THE SOFTWARE THAT COMES WITH THE TEXT. Due to the nature of VB Macros, the software only works on Windows-based laptop computers. Consequently, each participant is required to have access to a Windows-based laptop computer with Microsoft Excel installed on it. (I apologize in advance to Macintosh & Linux users BUT THIS IS OUT OF MY CONTROL. Consider using the Citrix client available at the Smith School or software like Parallels that allows you to run Windows programs on Macs and Linux machines.)

ATTENDANCE
You are expected to attend ALL SESSIONS. Failure to attend all sessions WILL result in lowering of your grade.

MODULES
The material will be presented in four modules (see the pre-course readings and coverage of topics table below), one on each of the four days August 4-7, 2016. The modules covered will be decision trees and probability, optimization, data analysis and regression, and simulation.

PRE-COURSE READINGS & COVERAGE OF TOPICS WITHIN MODULES
Make sure to complete the pre-work and assigned readings before August 4th. If you have any questions post them on the discussion section of the course website. Since the face-to-face contact in the course is compressed into 4 days, to maximize your learning, and the interaction in those 4 days it is imperative that you complete the assigned readings prior to August 4th. Use the discussion section on the course website to post any questions you may have.

DELIVERABLES
There is a graded pre-course assignment (individual) that is due electronically (using canvas) before the first day of class. Each day there will be a short in class assignment (individual) that will be graded. To facilitate transferring files to the instructor, please bring a memory stick with you if possible. There are 4 case analyses assignments that will be done in teams of 3 students (The Smith executive MBA program will determine team assignments). Problem sets and cases will be discussed in class. Each team is required to submit a final report on each problem set/case. The write-ups for the assignments are due electronically by August 22nd. (Due to EMBA office policies and deadlines for grade submission there can be no extensions to this due date!) It is also possible that there will be some post work that is assigned on an individual basis.
<table>
<thead>
<tr>
<th>MODULES</th>
<th>DATE</th>
<th>PRE-CLASS READINGS</th>
<th>TOPICS COVERED</th>
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</thead>
<tbody>
<tr>
<td>Decision Trees and Probability</td>
<td>8/4/2016</td>
<td>Sections 1.1 – 1.4 of text. Sections 2.1 – 2.6 of text. Case (in Section 1.6): The Acquisition of DSOFT. Merck Case (HBS) Analytics Edge Ch. 1, 2, 3.</td>
<td>Decision Analysis &amp; Probability. Chapter 1 &amp; 2 of text.</td>
</tr>
<tr>
<td>Data Analysis and Regression</td>
<td>8/6/2016</td>
<td>Sections 3.1 – 3.4 of text. Sections 4.1, 4.2, 4.8, and 4.9 of text. Sections 6.1 – 6.4 of text. Case (in Section 6.11): Predicting Heating Oil Consumption at OILPLUS. Case (in Section 6.9): Compensation at CERNA. Analytics Edge Ch 4, 10.</td>
<td>Data Analysis Chapters 3, 4 Regression. Chapter 6</td>
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**GRADING**

Your overall grade for the course will be determined on the following basis:

- Pre-course assignment (individual): 20%
- Class participation & in-class assignments (individual): 30%
- (Post-work) Problem/Case analyses Assignments: 50%
Class participation includes not only preparation for the problem/case, analysis, but also the demonstration of an ability to ask questions, provide comments and engage in constructive class discussion.

**ACADEMIC INTEGRITY**

The University's Code of Academic Integrity is designed to ensure that the principles of academic honesty and integrity are upheld. All students are expected to adhere to this Code. The Robert H. Smith School does not tolerate academic dishonesty. All acts of academic dishonesty will be dealt with in accordance with the provisions of this code. Please visit the following website for more information on the University's Code of Academic Integrity: [http://www.studenthonorcouncil.umd.edu/code.html](http://www.studenthonorcouncil.umd.edu/code.html)

On each exam or assignment you will be asked to write out and sign the following pledge. "I pledge on my honor that I have not given or received any unauthorized assistance on this exam/assignment."

**COURSE WEBSITE**

The course website has multiple purposes to facilitate your learning in this course. First, it will be a repository for the course handouts. Additionally, course homeworks, solutions, etc. will be posted on the website. Use the course website to post questions/communicate. This will be the easiest and fastest way for me to respond to your questions.

The course website must be used to submit homework assignments (unless otherwise stated on the assignment). Please type up your homework assignments using Microsoft Word or whatever other package you use for word processing. You should design your spreadsheets so that they are easy to follow. It is easy to annotate spreadsheets by adding text boxes. When you submit your homework, if it is a single file, name your file your loginname under the course website system followed by HW1.xlsx or HW1.docx. For example if my login name were raghavan, I would submit the homework as raghavanhw1.xlsx. If you have more than 1 file, use a program like 7Zip to create a single zip or rar file containing all your files. In this case when you submit the assignment, call your file yourloginname followed by the assignment number and the extension .zip. For example if I were submitting multiple files, I would use the file name raghavanhw1.zip. If this is a team assignment follow the same instructions except use the team number as part of the file name (e.g., team1hw1.zip).

**SPECIAL NEEDS**

Any student with special needs should bring this to the attention of the instructor as soon as possible, but not later than the end of the first class.