BZAN 7320: Business Modeling for Competitive Advantage
&   SCM 7320: Supply Chain Analytics
Section 15936 & 24490   Thu 6 – 9   Fall 2020

** PRELIMINARY COURSE SYLLABUS **

Instructor: Michael J. Murray, PhD, PE   **Office:** Online   **Office Phone:** 713-858-8290
Student Hours: Individual Zoom sessions by appointment T/Th 4 – 5 pm
Email: Please use BlackBoard messages for _all_ course correspondence

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Course Description

This course is intended to help students develop the analytical skills needed to examine unstructured business problems, develop decision models, analyze alternatives, and make sound recommendations for action. Among the techniques we will study are: problems of optimization (e.g., resource allocation), risk analysis, data analytics, and forecasting. In each area we will consider specific operations, finance and marketing problems. We will build models, analyze them using various Excel-based tools and add-ins, and most importantly interpret the economic value of the solutions.

How do BZAN 7320 _Business Modeling for Competitive Advantage_ and SCM 7320 _Supply Chain Analytics_ differ?

BZAN 7320 is an advanced elective offered broadly to graduate students in the Bauer College of Business and other colleges. It covers descriptive and predictive analytics using R, optimization using the Excel Solver, and Monte Carlo simulation using @Risk. The case studies and applications throughout the course cover a variety of business problems.

SCM 7320 is a required course in the MS SCM program. It covers the same topics as BZAN 7320, but instead of using Excel for optimization it introduces student to mathematical programming techniques using LINGO, a mathematical modeling language. In addition, the case studies and applications in SCM 7320 are focused on supply chain topics.

Important information

Course delivery

This course is being offered in the Synchronous Online format. Synchronous online class meetings will take place according to the class schedule. There is no face-to-face component to this course. In between synchronous class meetings, there may also be asynchronous activities to complete (e.g., discussion forums and assignments). It is critical that all students attend the class meetings, as there is a real-time team-based simulation activity scheduled for seven classes. The simulation requires students to make decisions during the exercise, and it is not possible for one or two students to successfully manage the activity of a team.

Excused Absence Policy

Regular class attendance, participation, and engagement in coursework are important contributors to student success. Absences may be excused as provided in the University of Houston Undergraduate Excused Absence Policy and Graduate Excused Absence Policy for reasons including: medical illness of student or close relative, death of a close family member, legal or government proceeding that a student is

obligated to attend, recognized professional and educational activities where the student is presenting, and University-sponsored activity or athletic competition. Additional policies address absences related to military service, religious holy days, pregnancy and related conditions, and disability.

Recording of Class

Students may not record all or part of class, livestream all or part of class, or make/distribute screen captures, without advanced written consent of the instructor. If you have or think you may have a disability such that you need to record class-related activities, please contact the Center for Students with DisABILITIES. If you have an accommodation to record class-related activities, those recordings may not be shared with any other student, whether in this course or not, or with any other person or on any other platform. Classes may be recorded by the instructor. Students may use instructor's recordings for their own studying and notetaking. Instructor's recordings are not authorized to be shared with anyone without the prior written approval of the instructor. Failure to comply with requirements regarding recordings will result in a disciplinary referral to the Dean of Students Office and may result in disciplinary action.

Webcams

Access to a webcam is required for students participating remotely in this course. Webcams must be turned on (state when webcams are required to be on and the academic basis for requiring them to be on). (Example: Webcams must be turned on during exams to ensure the academic integrity of exam administration.)

Resources for Online Learning

The University of Houston is committed to student success, and provides information to optimize the online learning experience through our Power-On website. Please visit this website for a comprehensive set of resources, tools, and tips including: obtaining access to the internet, AccessUH, and Blackboard; requesting a laptop through the Laptop Loaner Program; using your smartphone as a webcam; and downloading Microsoft Office 365 at no cost. For questions or assistance contact UHOnline@uh.edu.

Course Objectives

This course supports the MBA program learning goals in the following ways:

- **Cross disciplinary competence** – Practice translating descriptions of decision making problems in various business disciplines into formal models, and investigate those models in an organized fashion.
- **Critical thinking** – Skillfully build customized computer models for use in decision support, interpret model results, draw conclusions supported by the results and effectively present those conclusions.
- **Communication** – Strengthen students' ability to identify the key results of analysis and present them in useful ways to support decision making.

In addition to the MBA learning goals, there are a number of specific objectives that are part of this course. These objectives are described in more detail on the course website.

This course is intended to help students develop the analytical skills needed to examine unstructured business problems, develop decision models, analyze alternatives, and make sound recommendations for action. The figure below illustrates how the course is organized. There are four main components: 1) learning advanced Excel tools and data mining, 2) developing a structured approach to modeling business problems, 3) applying optimization techniques using Solver, and 4) decision making under uncertainty/static simulation.
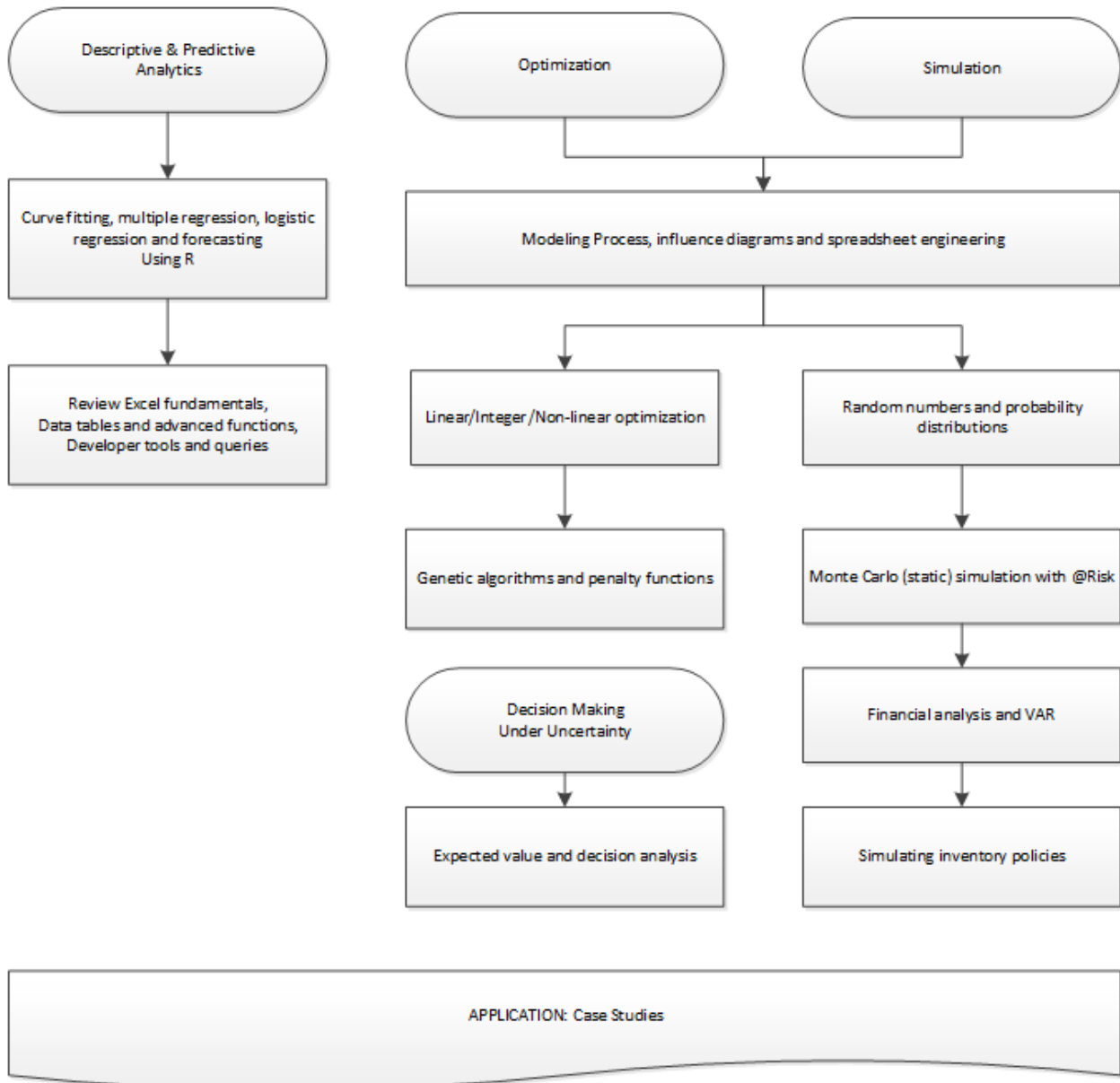
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┌─────────────────────┐      ┌─────────────────────┐    ┌─────────────────────┐
│ Descriptive &        │      │    Optimization      │    │     Simulation       │
│ Predictive Analytics │      └─────────────────────┘    └─────────────────────┘
└─────────────────────┘
         │                               │                          │
         ▼                               ▼                          │
┌─────────────────────┐      ┌──────────────────────────────────────┐
│ Curve fitting,       │      │ Modeling Process, influence diagrams  │
│ multiple regression, │      │ and spreadsheet engineering           │
│ logistic regression  │      └──────────────────────────────────────┘
│ and forecasting      │                 │
│ Using R              │          ┌──────┴──────────┐
└─────────────────────┘          ▼                  ▼
         │              ┌──────────────────┐  ┌──────────────────────┐
         ▼              │ Linear/Integer/  │  │ Random numbers and   │
┌─────────────────────┐ │ Non-linear       │  │ probability          │
│ Review Excel         │ │ optimization     │  │ distributions        │
│ fundamentals, Data   │ └──────────────────┘  └──────────────────────┘
│ tables and advanced  │          │                      │
│ functions, Developer │          ▼                      ▼
│ tools and queries    │ ┌──────────────────┐  ┌──────────────────────┐
└─────────────────────┘ │ Genetic          │  │ Monte Carlo (static) │
                        │ algorithms and   │  │ simulation with @Risk │
                        │ penalty functions│  └──────────────────────┘
                        └──────────────────┘             │
                          ┌───────────────┐              ▼
                          │ Decision      │   ┌──────────────────────┐
                          │ Making Under  │   │ Financial analysis   │
                          │ Uncertainty   │   │ and VAR              │
                          └───────────────┘   └──────────────────────┘
                                  │                      │
                                  ▼                      ▼
                          ┌───────────────┐   ┌──────────────────────┐
                          │ Expected value│   │ Simulating inventory │
                          │ and decision  │   │ policies             │
                          │ analysis      │   └──────────────────────┘
                          └───────────────┘
┌──────────────────────────────────────────────────────────────────┐
│              APPLICATION: Case Studies                              │
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Figure 1: Business Modeling for Competitive Advantage/ Supply Chain Analytics Course Outline

Among the techniques we will study are: regression, forecasting, linear/non-linear optimization, and risk analysis using Monte Carlo simulation. In each area we will consider specific operations, finance and marketing problems. We will build models, analyze them using various Excel-based tools and add-ins (or mathematical modeling tools in the case of SCM 7320), and most importantly interpret the economic value of the solutions.

While we will be using Excel or LINGO as our primary modeling "language", this is not a course in Excel or a programming course in R or LINGO; rather, it is a course that will help you to integrate much of what you are learning in your MBA/MS curriculum in a way that will allow you to add value to your organization.

Course textbook and requirements

Textbook: *Practical Management Science 5th ed.,* ISBN 978-1-305-25090-1 (ISBN is hardcover version). This is not the most recent edition of the textbook, so it is available for a reasonable price. You can then get a copy of the Palisade Decision Tools software from HERE. Note: you need to have the textbook to comply with the license terms to use the software in this course; otherwise you will need to purchase an academic license for the software.

Additional requirements:

- Laptop computer with Windows 7 OS or later. **Because of issues with the Excel add-ins, Mac users must be able to run Windows either as the native OS or via Boot Camp, VMware Fusion, etc.** Please note that the instructor is NOT an expert in operating systems or hardware!
- Microsoft Excel 2013 or later, and Microsoft PowerBI desktop (free).
- R and RStudio (open source statistical software).
- *Licensed version* of Palisade Decision Tools Suite and other Excel add-ins.
- **SCM 7320 students** must also have LINGO ver. 18 (free) and the textbook "Optimization Modeling with LINGO" (provided on BlackBoard)

Course Delivery

This course is normally presented in a **hybrid** format which blends the traditional in-person format with an online format. The majority of the lectures and other basic material are covered outside of class through online activities, such as watching course videos and working practice problems. Class time is used to explore, discuss and review more advanced concepts and to take assessments. We will follow this model for the synchronous online class. **NOTE:** To be successful in this course students should be prepared to spend 4-6 hours per week outside of class in addition to in-class activities.

Guided Practice: these are structured activities outside of class that introduce modeling concepts through reading, watching video lectures, and other activities.

Self-assessments: these exercises focus on quantitative skills and conceptual understanding of the material introduced through Guided Practice. They are graded on a pass (full credit) /needs improvement (half credit) basis to encourage you to focus on learning the material rather than competing for points.

Class activities: we will focus on the advanced learning objectives for the course, and work problems that will promote a deeper understanding of optimization and simulation.

Concept Quizzes: at the conclusion of each course topic (Regression and Forecasting, Optimization Modeling, and Decision Making under Uncertainty) you will have an in class quiz that will provide you with an opportunity to demonstrate your competence in that topic.

Modeling projects: In addition to the guided practice problem sets and concept quizzes, you will have an opportunity to complete three projects that apply modeling techniques to real world applications and that use or simulate real world data. These projects are also meant to challenge you to present your results in a way that is readily understood.

Grading

Let's talk frankly about grades for a minute. Your purpose in taking this course should be to learn interesting and valuable skills that can help you in your career, not to score points and get a particular letter grade. If you spend more time thinking about grades than about business modeling, then you will not be taking full advantage of the opportunity to learn new concepts and develop your skills.

The problem sets, concept quizzes and case studies will be weighted as follows to determine each student's final grade:

Item	Value
10 practice problem (pass/needs improvement)	25%
3 assessments	30%
3 modeling projects	45%
Total	100%

The practice problems are graded as a Pass (full credit) or Needs improvement (half credit) basis where >= 70% results in full credit. You will have two opportunities to earn full credit for the problem sets prior to the deadline for each.

The following scale will determine you final course grade[1]:

≥ 90	A	76.67 – 79.99	B-
86.67 – 89.99	A-	73.33 – 76.66	C+
83.33 – 86.66	B+	70.00 – 73.32	C
80.00 – 83.32	B	< 70	C-

Modeling Projects

The modeling projects are key deliverables of the course. These are unstructured problems that are intended to simulate problems you might encounter on the job. You should plan to work on the modeling projects in self-determined teams of two. HOWEVER both people are expected to contribute effort on ALL projects; DO NOT "take turns" working the projects as that will defeat the purpose of them.

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[1] Grades are earned on the basis of performance in this course, not given on the basis of need or effort. This grading scale already includes a curve, so there will be no rounding up. NOTE: I do not reply to email requesting a grade change or opportunities for extra credit.

Each project requires you to build a decision model from scratch. This means you must first identify the decision that is required by the project. Here you may find that using an influence diagram or other mapping tool will help you to understand the problem better, as well as helping to identify the information you will need to build the model. In many cases you will also need to draw upon your knowledge of the various business disciplines (finance, supply chain, etc.) to develop the model.

Next it is important for you to explore alternatives that may affect the decision. Keep in mind that any model is only as good as the assumptions that went into building it, so be sure to document your base assumptions and then determine how the results might change if those assumptions were different. This is known as "parametric analysis", and it is a key part of the decision modeling process.

Finally, make specific recommendations to address the issues you identified. Among the model alternatives you develop, one will usually stand out as being clearly better. Describe the next steps that should be taken to execute your recommendation(s) and provide some guidance how to evaluate whether or not it is successful. Think in terms of specific performance measures that will indicate that your recommendations are having an impact. Don't use imprecise measures such as "increase profit" or "decreased cost"; try to identify specific targets that can be monitored. While you may not be able to provide exact time/cost estimates, it is important to ensure that your recommendation is feasible.

Each project should consist of a report to management containing the following:

- Executive summary – brief description of the issues you identified and your recommendation(s)
- Model description – here you should document what the model does and the inputs necessary
- Parametric analysis – what changes you made to the model basis to determine how the results change, and a comparison of the various options to determine the best recommendation. _Be sure to include graphs, charts or tables that summarize your analyses where appropriate_.
- Conclusion – what are the next steps, and what performance metrics should be monitored?
- Appendix – the actual model you developed in R, Excel, or LINGO

Academic Integrity

Students may be asked to sign an honor code statement as part of their submission of any graded work including but not limited to projects, quizzes, and exams: "_I understand and agree to abide by the provisions in the University of Houston Graduate Academic Honesty Policy. I understand that academic honesty is taken very seriously and, in the cases of violations, penalties may include suspension or expulsion from the University of Houston._" In particular, the following four principles apply to this class:

- All problem sets and quizzes should reflect _your own effort only_ (except as noted above for the case studies where work with other students is documented). Discussion with others from another section about graded submissions is a violation of the Academic Honesty Policy.
- _**Passing case notes and class handouts to students who have yet to take the course, who attend a different section, or receiving material from those who took the class in the past, is strictly prohibited.**_
- Plagiarizing (the misrepresentation of work done by others as being one's own work) is a violation of the Academic Honesty Policy. Remember to cite all sources of information and ideas to prevent problems.
- You may _not_ submit the same work (or substantially similar work) to meet the requirements of more than one course without the written consent of all instructors concerned.

Teaching Philosophy

My teaching philosophy is based on the goal of leading you to develop skills that will help you achieve success in your professional careers and personal lives. I spent most of my career working in industry and I know first-hand how important it is to have intellectual curiosity matched with an ability to critically analyze the issues faced by organizations large and small. I believe that your education should be focused on more than just learning the contents of the textbooks we use. You must understand and be able to articulate the knowledge you gain before you can apply it successfully.

I will challenge you to think critically about the problems we discuss, and I will help you develop both an intuitive understanding of problems and a systematic approach to solving them. Realizing that all of you have diverse learning styles I will try to engage you in a number of ways to help you gain a better understanding of the subject at hand. For me teaching is an opportunity to provide you with some of the advantages I have received in my education and career, and I consider it a privilege to pass on what I have learned.

Accommodations for Students with Disabilities

My objective is to help all students achieve their highest potential in the Bauer College of Business. If you need to receive accommodation in the classroom, on exams or with assignments, please make arrangements with me prior to the exam or assignment. You can also contact the Justin Dart Center for Students with (dis)Abilities (713-743-5400) to obtain assistance. Services provided by the Dart Center include assistance with course accommodations, adaptive equipment, individualized exam administration, taped textbooks, wheelchair repair, library needs, handicapped parking, as well as many other needs.

Counseling and Psychological Services

Counseling and Psychological Services (CAPS) can help students who are having difficulties managing stress, adjusting to college, or feeling sad and hopeless. You can reach CAPS (www.uh.edu/caps) by calling 713-743-5454 during and after business hours for routine appointments or if you or someone you know is in crisis. Also, there is no appointment necessary for the "Let's Talk" program, which is a drop-in consultation service at convenient locations and hours around campus. http://www.uh.edu/caps/outreach/lets_talk.html.

Other helpful information

COVID-19 Updates: https://uh.edu/covid-19/

Coogs Care: https://www.uh.edu/dsaes/coogscare/

Laptop Checkout Requests: https://www.uh.edu/infotech/about/planning/off-campus/index.php#do-you-need-a-laptop

Health FAQs: https://uh.edu/covid-19/faq/health-wellness-prevention-faqs/

Student Health Center: https://uh.edu/class/english/lcc/current-students/student-health-center/index.php

Class schedule

Due to the changing nature of the COVID-19 pandemic, please note that the instructor may need to make modifications to the course syllabus and may do so at any time. Notice of such changes will be announced as quickly as possible through BlackBoard announcements. Given the quantitative nature of this course, it is critical for you to review all the material posted on BlackBoard in order to gain the most value from this course.

BZAN 7320 Business Modeling for Competitive Advantage
Tentative Class Schedule Fall 2020

	Date	BZAN 7320 Topic	SCM 7320 Topic	BZAN Reference	SCM Reference	Assignment due
Regr & Forecast	27-Aug	Course intro; Intro to R and Rstudio		Notes		
	3-Sep	Multiple and logistic regression in R		Notes, PMS 14		PP-01
	10-Sep	Forecasting in R		Notes, PMS 14		PP-02
	17-Sep	**Assessment #1: Regression and Forecasting**		Notes, PMS 14		
	20-Sep	*Case study project #1 due*				**Project #1**
Optimization	24-Sep	Modeling process/ Linear optimization: Product mix	Modeling process/ optimization with LINGO	PMS 4	LINGO ch. 1, 3	PP-03
	1-Oct	Mixed integer models: Transportation/ Assignment	LINGO SETS and looping functions	PMS 5, 6	LINGO ch. 5	PP-04
	8-Oct	Non-linear models: Blending	Product mix and blending in LINGO	PMS 7	LINGO ch. 10	PP-05
	15-Oct	Non-linear models: Genetic Algorithms		PMS 8		PP-06
	22-Oct	**Assessment #2: Optimization**		PMS 4 - 8	LINGO, PMS 8	
	25-Oct	*Case study project #2 due*				**Project #2**
Simulation & Queueing	29-Oct	Decision making under uncertainty/ Intro to simulation		Notes, PMS 9		PP-07
	5-Nov	Simulation modeling		PMS 10		PP-08
	12-Nov	Financial models and VAR		PMS 11		PP-09
	19-Nov	Inventory and supply chain models		PMS 12		PP-10
	26-Nov	*Thanksgiving Holiday*				
	3-Dec	**Assessment #3: Simulation**		Notes, PMS 9 - 12		
	6-Dec	*Case study project #3 due*				**Project #3**

Revised: **8/20/2020**