BZAN 7320 Business Modeling for Competitive Advantage Spring 2023
Section 13216 Hybrid Format Tue 6 – 9

**** PRELIMINARY COURSE SYLLABUS ****

Instructor: Michael J. Murray, PhD, PE **Office:** Online **Office Phone:** 713-743-4667
Student Hours: Open hours via Zoom Mon 6 – 7 pm/ Thu 4 – 5 pm, and by appointment at other times.
Email: Please use Canvas messages or Cougarnet email for *all* course correspondence

Course Description

This course is designed 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 techniques we will study include: problems of optimization (e.g., resource allocation), risk analysis, data analytics, and forecasting. In each area we will consider specific supply chain operations, finance and other business-related problems. We will build models, analyze them using mathematical programming and other tools, and most importantly interpret the economic value of the solutions.

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. A basic understanding of statistics and finance is assumed.

Course Objectives

The primary goal of this course is to teach you how to take an unstructured business issue, translate it into a decision model, analyze the results of the model and make a recommendation. While we will be using Excel as our primary modeling "language", this is not a course in Excel; rather, it is a course in decision modeling that will help you to integrate much of what you are learning in your graduate curriculum in a way that will allow you to add value to your organization.

There are a number of specific objectives that are part of this course. These objectives are listed in Appendix A, and described in more detail each week in the Learning Modules on the course website.

Course textbook and requirements

Textbooks:

Applied Statistics with R (ASR – online, free)
Forecasting Principles & Practice, 3rd ed. (FP&P – online, free)
Practical Management Science, 6th ed.., (PMS) ISBN 978-1-337-40665-9.

Other materials:

- A link to purchase case studies for the course will be provided on Canvas
- Supplemental course readings will be provided on Canvas

Additional requirements:

- Laptop computer with Windows 8 OS or later. **Mac users must be able to run Windows either as the native OS or via emulation (i.e., Boot Camp, Parallels, VMware Fusion, etc.) in order to use Power BI and the Excel add-in.**
- Microsoft PowerBI desktop (Windows only) and Tableau desktop (both free).
- R and RStudio (open source statistical software).
- Excel Solver Table (free) and Palisade Decision Tools Suite (Windows only) add-ins.

Course Administration

Because of the need to offer this course in an online format, as well as the ongoing respiratory virus tripledemic, class this semester will be presented mostly in a **remote synchronous format**. As with all courses, this means that you must take an active role in mastering the learning objectives. Your work in this course will follow a regular pattern that will involve activities before, during, and after our class meetings:

BEFORE the class meeting starts: You'll start by working on a weekly Learning Module (LM). These contain notes, textbook readings, videos and exercises organized by learning target that will help you learn the basics of new material and prepare you for more application-focused work in class. Each LM includes a Learning Target (LT) assessment that covers the main tasks that you should be able to perform to demonstrate mastery of that learning target.

DURING the class meeting: Class time is reserved for answering questions regarding the weekly learning target, doing active exercises together in teams or as individuals. We will focus on activities that apply and extend what you learn in the Learning Modules.

AFTER the class meeting: You'll have an opportunity to re-take the weekly Learning Target (LT) assessment to demonstrate your improved understanding of the learning target, and to complete projects that will become part of your project portfolio.

To be successful in this course you should be prepared to spend 4-6 hours per week outside of class in addition to in-class activities.

Grading/ evaluation

Your reason for taking this course should be to learn interesting and valuable skills that can help you in your career. In other words, your focus should be on achieving your learning objectives, not on whether you score enough points to receive a particular grade. I have designed this course to help you achieve that learning goal, using the following principles:

1. The best way to learn these skills is by doing active work on the applications of these concepts.
2. Mistakes, and work that does not demonstrate proficiency in a learning target, should not be penalized. Instead, if your work would benefit from redoing parts or all of it you should be given an opportunity to do so.
3. People learn best from making mistakes and fixing them with feedback and reflection.

I will apply these principles as follows; you will have multiple opportunities to demonstrate mastery of each of the course learning targets:

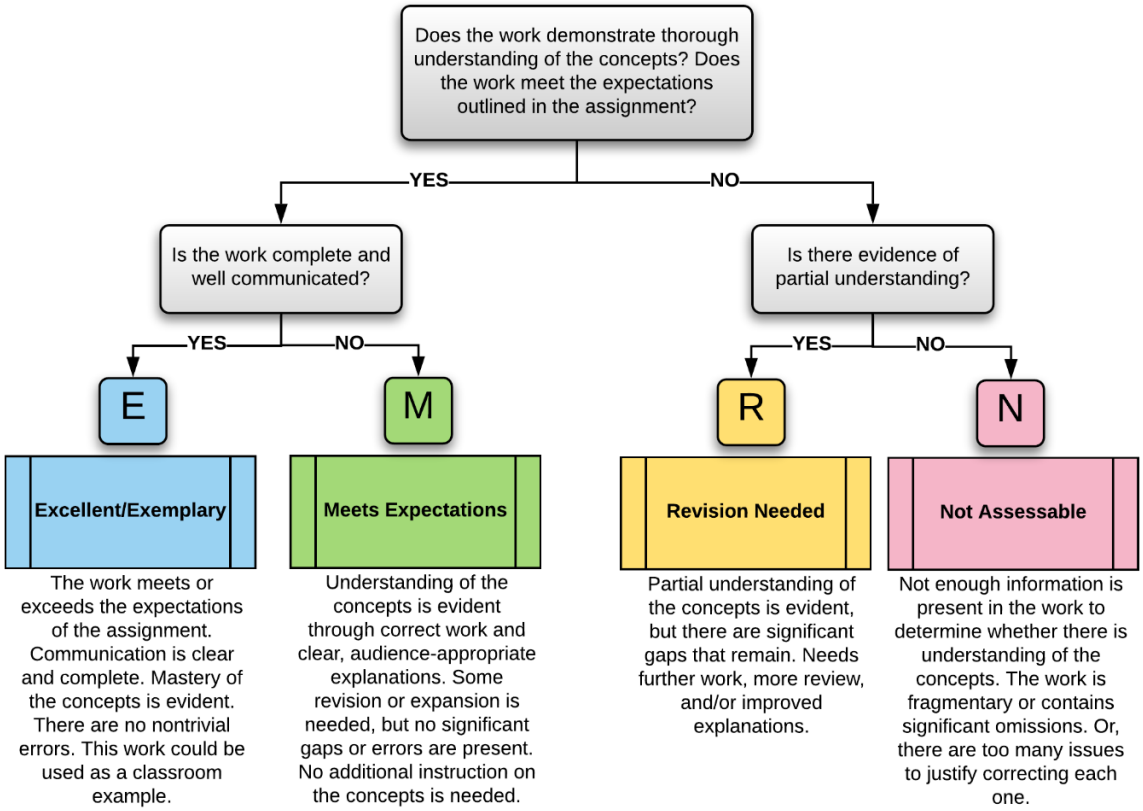
- **Individual learning target assessments**: The weekly learning target assessments consist of multiple problems for each learning target. Each assessment is scored separately using specific criteria (typically $\geq$ 70% correct) to determine whether a student clearly demonstrates proficiency in that learning target. *Mistakes and work that does not meet the standard for proficiency are not penalized*. If you do not meet the proficiency criteria on your first attempt for that learning target you may retake the assessment. This is to provide you with an opportunity to learn and improve by reflecting on your errors and correcting them. If you retake the assessment, the higher of the two scores will be used to determine proficiency.

- **Summary core assessments:** will be assessed at the end of each module. These assessments will consist of several problems, each of which focuses on a particular criterion for demonstrating proficiency/ mastery of the learning targets in that module. Core assessments will be scored on a 0 – 4 scale as follows: Mastery ($M \geq 3.25$), Proficient ($3.25 > P \geq 2.5$), or Not Demonstrated ($N < 2.5$).

  Project portfolio/ case studies: There are three case studies that give you an opportunity to apply/extend what you have learned to real-life problems. Each project requires you to build a decision model from scratch. First identify the decision that is required for the case study. Then apply the other steps in the modeling process to develop the model, analyze the alternatives, and make a recommendation. In some cases you may need to draw upon your knowledge of the various business disciplines (finance, supply chain, etc.) to analyze the problem. Finally, present your work in a clear, concise format using summary tables, graphs and charts to supplement your narrative.

  These projects are key deliverables of the course. You should plan to work on the modeling projects individually or in self-determined teams of two provided that *both people contribute equal effort*. Each case study will be due at the end of the module in which the topics are first presented.

  The grading process for the modeling project case studies is outlined in the flowchart below:



EMRN rubric based on the EMRF rubric, due to Rodney Stutzman and Kimberly Race: http://eric.ed.gov/?id=EJ717675

Your grade in this course is earned by demonstrating evidence of skill on the main concepts in the course, and by showing engagement with the course through the weekly assessments and active class participation. Rather than using a weighted average score, the work you submit will be evaluated against quality standards for each assignment. If your work meets the standard, then you will receive credit for it. This is similar to the way you are evaluated in professional practice.

To earn a grade you need to meet all the requirements shown in the row for that grade:

Grade	Learning target Proficiency (out of 11)	Core	Projects
A	≥ 9	≥ 2 M + 1 P	≥ 2 E + 1 M
B	At least 8	1 M + 2 P	1 E + 2 M
C	Fewer than 8	At least 2 P	At least 2 M

Plus/minus grades will be assigned based on how close you are to the next higher or lower grade level using performance on the core learning assessments to determine assignment of +/- grades.

With the exception of the projects, students are expected to work on all course assignments independently. This means that the Learning Target assessments you submit must be your own work. **Copying another student's work, using student materials from a prior semester (including case studies and assessment files and/or screenshots), or working with other students on the assessments is considered academic dishonesty**.

Class schedule

Due to public health or weather issues the instructor may need to make modifications to the course syllabus and may do so at any time. These changes will be announced as quickly as possible through Canvas.

BZAN 7320 Business Modeling for Competitive Advantage
Initial Class Schedule Spring 2023

Date		Topic	Textbook ref.	Assignment due
Regression & Forecasting	19-Jan	Course orientation; Visualization with Power BI and Tableau	Notes	LT-01
	26-Jan	Introduction to R/Rstudio; simple regression	ASR 7	LT-02
	2-Feb	Multiple regression; categorical variables	PMS 13	LT-03
	9-Feb	Time series forecasting	PMS 13/ FP&P 8	LT-04
	16-Feb	**Assessment #1: Visualization & forecasting**		Project #1 due 2/20
Optimization	23-Feb	Intro to linear optimization	PMS 3	LT-05
	2-Mar	Resource allocation/ product mix	PMS 4	LT-06
	9-Mar	Network models/ binary variables in optimization	PMS 5, 6	LT-07
	16-Mar	***Spring Break - no class***		
	23-Mar	Non-linear optimization	PMS 7, 8	LT-08
	30-Mar	**Assessment #2: Optimization modeling**		Project #2 due 4/ 3
Simulation & VaR	6-Apr	Decision trees/ Intro to Monte Carlo simulation	PMS 10	LT-09
	13-Apr	Simulation models	PMS 11	LT-10
	20-Apr	Financial applications/ Value-at-Risk (VaR)	PMS 11	LT-11
	27-Apr	**Assessment #3: Simulation and VaR**		Project #3 due 5/ 1

Revised: **1/ 3/2023**

Appendix A: BZAN 7320 Learning Targets

Visualization and forecasting

Objective: I can use visualization tools and statistical modeling techniques to analyze data and develop forecasts.

1. I can use visualization tools to analyze data and develop useful insights.

2. I can perform a simple regression and explain the results.

3. I can include both numeric and categorical variables in a multiple regression and draw meaningful conclusions from the results.

4. I can use exponential smoothing techniques to develop a time series forecast.

Optimization modeling

Objective: I can use mathematical programming tools to set-up, analyze and interpret the results of an optimization problem.

5. I can properly identify the decision variables, constraint equations and the objective function in an optimization problem and explain how changes to either the objective coefficients or the value of a constraint affects the results of the optimization.

6. I can develop, analyze, and interpret the results of a resource allocation/ product mix optimization problem.

7. I can model network/ location problems and use binary variables to implement constraints in an optimization problem.

8. I can setup and solve non-linear problems using the GRG algorithm, and I can clear denominators to convert a non-linear blending problem to one that can be solved using linear methods.

Simulation

Objective: I can use Monte Carlo simulation to quantify project risk and develop a better understanding of the parameters that impact the results of a problem with uncertain inputs.

9. I can model multi-stage decision processes and determine the best course of action based on the expected value of the outcome.

10. I can apply probability distributions to model problems with uncertain variables and perform simulations using Monte Carlo techniques.

11. I can quantify the value-at-risk of a project, determine the probability of a negative NPV, and identify the random variables that have the most influence on the results.

Appendix B: Important supplemental information

COVID-19 Information

Students are encouraged to visit the University's COVID-19 website for important information including diagnosis and symptom protocols, testing, vaccine information, and post-exposure guidance. Please check the website throughout the semester for updates. Consult the (select: Undergraduate Excused Absence Policy or Graduate Excused Absence Policy) for information regarding excused absences due to medical reasons.

Reasonable Academic Adjustments/Auxiliary Aids

The University of Houston complies with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, pertaining to the provision of reasonable academic adjustments/auxiliary aids for disabled students. In accordance with Section 504 and ADA guidelines, UH strives to provide reasonable academic adjustments/auxiliary aids to students who request and require them. If you believe that you have a disability requiring an academic adjustments/auxiliary aid, please contact the Justin Dart Jr. Student Accessibility Center (formerly the Justin Dart, Jr. Center for Students with DisABILITIES).

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. Under these policies, students with excused absences will be provided with an opportunity to make up any quiz, exam or other work that contributes to the course grade or a satisfactory alternative. Please read the full policy for details regarding reasons for excused absences, the approval process, and extended absences. 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 Justin Dart, Jr. Student Accessibility Center. 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.

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, Blackboard, and Canvas; using your smartphone as a webcam; and downloading Microsoft Office 365 at no cost. For questions or assistance contact UHOnline@uh.edu.

UH Email
Please check and use your Cougarnet email for communications related to this course. To access this email, login to your Microsoft 365 account with your Cougarnet credentials.

Webcams
Access to a webcam is required for students participating remotely in this course. Webcams must be turned on during exams to ensure the academic integrity of exam administration, and at other times when requested by the instructor.

Academic Honesty Policy
High ethical standards are critical to the integrity of any institution, and bear directly on the ultimate value of conferred degrees. All UH community members are expected to contribute to an atmosphere of the highest possible ethical standards. Maintaining such an atmosphere requires that any instances of academic dishonesty be recognized and addressed. The UH Academic Honesty Policy is designed to handle those instances with fairness to all parties involved: the students, the instructors, and the University itself. All students and faculty of the University of Houston are responsible for being familiar with this policy.

Title IX/Sexual Misconduct
Per the UHS Sexual Misconduct Policy, your instructor is a "responsible employee" for reporting purposes under Title IX regulations and state law and must report incidents of sexual misconduct (sexual harassment, non-consensual sexual contact, sexual assault, sexual exploitation, sexual intimidation, intimate partner violence, or stalking) about which they become aware to the Title IX office. Please know there are places on campus where you can make a report in confidence. You can find more information about resources on the Title IX website at https://uh.edu/equal-opportunity/title-ix-sexual-misconduct/resources/.

Security Escorts and Cougar Ride
UHPD continually works with the University community to make the campus a safe place to learn, work, and live. Our Security escort service is designed for the community members who have safety concerns and would like to have a Security Officer walk with them, for their safety, as they make their way across campus. Based on availability either a UHPD Security Officer or Police Officer will escort students, faculty, and staff to locations beginning and ending on campus. If you feel that you need a Security Officer to walk with you for your safety please call 713-743-3333. Arrangements may be made for special needs.

Parking and Transportation Services also offers a late-night, on-demand shuttle service called Cougar Ride that provides rides to and from all on-campus shuttle stops, as well as

the MD Anderson Library, Cougar Village/Moody Towers and the UH Technology Bridge. Rides can be requested through the UH Go app. Days and hours of operation can be found at https://uh.edu/af-university-services/parking/cougar-ride/.

Syllabus Changes

Please note that the instructor may need to make modifications to the course syllabus. Notice of such changes will be announced as quickly as possible through email and announcements on the course management system (Canvas).

Helpful Information

Coogs Care: https://uh.edu/dsa/coogscare/

Student Health Center: https://www.uh.edu/healthcenter/