JOHNS HOPKINS
CAREY BUSINESS SCHOOL

Business Analytics
2 Credits

BU.520.601

Thursdays 8:30 AM – 11:30 AM EST
Jan 23 – Mar 12, 2024
Harbor East Campus, Room 215

Instructor
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Office Hours
Thursdays 11:30 AM – 12:30 PM, 4:30 PM – 5:30 PM (After class)
Also available by appointment over zoom (zoom.us/my/josephcutrone)

Teaching Assistant
Teaching assistants will be announced on Canvas.

Required Texts & Learning Materials
Stephen G. Powell and Kenneth R. Baker, *Business Analytics: The Art of Modeling with Spreadsheets*, 5th edition, John Wiley & Sons Inc. ISBN 978-1-119-29842-7 in Carey's online bookstore.

Additional learning material in the form of notes, copies of PowerPoint slides, videos and/or Excel spreadsheets will be posted each week.

Technology Requirements
You must have Excel Solver installed or available to be installed. A complete list of universal technology requirements for students in **online courses** (internet access, virus protection software, webcam, etc.) is provided within Blackboard's Student Resources section.

Course Description
Course Description and Overview
Business analytics makes extensive use of data and modeling to drive decision making in organizations. To become a leader in a data driven world, it is therefore critical to acquire hands-on experience of both data-related (statistical) and modelling skills. This class focuses on the latter: it introduces students to analytical frameworks used for decision making to make sense of the data. These include Linear and Integer Linear Programming, Decision Analysis, Foundations of utility and risk, and Monte Carlo Simulation. For each

methodology students are first exposed to the basic mechanics, and then apply the methodology to several business problems using software.

While a number of software programs are available, this course leverages the capabilities of MS Excel (However, students are welcome to use their preferred software packages including R, Matlab or Python). Emphasis will be not on programming, but rather on formulating problems, translating those formulations into useful models, optimizing and/or displaying the models, and interpreting results.

This course will not produce experts at modeling and/or programming (although students may be able to pick up a few spreadsheet skills along the way). Rather, the goal is to prepare managers who are comfortable with translating trade-offs into models, understanding the output of the software, and who are appreciative of quantitative approaches to decision making. The style of analysis, model development, optimization, and interpretation lends itself to a plethora of business settings, and develops a set of fundamental skills that are essential for survival in a data-driven world.

The course requires basic knowledge of algebra, as well as basic MS Excel knowledge. No programming knowledge is expected.

Learning Objectives
By the end of this course, students will be able to:
1. Identify and describe the trade-offs that define a problem setting.
2. Translate this understanding into a problem formulation.
3. Create a spreadsheet-based model that embodies this formulation.
4. Utilize the capabilities of Excel to develop insights about what should be done in the setting of interest.
5. Interpret the output of an analytical model and use it as a guide to improve performance.

To view the complete list of the Carey Business School's general learning goals and objectives, visit the Carey website.

Course Policies

Attendance
Attendance and class participation is expected from everyone; students are expected to inform in advance if they have to miss a class due to business travel or other important matters. They are, however, responsible for submission of assignments on time as well as keeping up with the material covered in the missed lecture. Failure to inform will be treated as absence without excuse. Absence due to illness or family emergency will be handled on individual basis.

Flipped Course
This course will be a flipped course. In a traditional course, usually a lecture is delivered by an instructor in class and students complete homework at home. In a flipped class, the students watch pre-recorded lecture videos at home before class and work on in class exercises during class time. Hence, instead of students doing homework after class, in a flipped classroom, the students will watch lecture videos before class. It is very important that you watch the videos before class for this method to work.

Assignments and Exams
The class will be divided into groups (of suitable sizes based on enrollment) for in class exercises; the same groups may be used for the group project.

- *Watching videos:* Students are expected to watch the videos before coming to each class (see the Videos column of the Course Calendar table).
- *Weekly Video Exercises:* Must be completed before all class sessions, will be based on material covered in the prerecorded videos for that week. You may miss 1 out of 7 Video Exercises.
- *Weekly Module Exercises:* Must be completed in class as a group with the instructor. There will be extra credit opportunities each week. You may miss 1 out of 7 Module Exercises.

- ***Participation:*** 12% of your course grade will come from participation during class. Your participation grade depends on the quality and quantity of your contribution. You can earn points by asking or answering questions. You will not be penalized for wrong answers as the objective of class time is for you to understand the material and think about it critically. If you are present but did not contribute (0 points), if you participated but did not contribute much (1 point), good contributions are 2 points, respectively. Good contribution means you were present and active and tried to answer or ask questions.
- ***Final Project:***
  This course involves a final group project where the final deliverables are Excel files and a 10-15-minute presentation. More details will be provided on this topic on Blackboard. The final project can be complete in three ways:
  1) *A novel problem:*
     The purpose of this type of course project is for you to correctly and completely formulate, solve, and analyze a novel problem of your choice using one or more of the methodologies discussed in class. You are not required to address a business problem. You may be creative in your problem selection; however, you must get approval from the instructor. In your presentation, you must include the following information:
  2) *Expanding knowledge on your own:*
     Hopefully, this project will encourage you to start the habit of learning more about a topic! In this type of project, the students may choose to explore a topic we discussed in more detail to expand their knowledge. For example, one of the well-known methods of solving linear programs is the simplex algorithm. The students may learn how the simplex algorithm works and how it can be coded on their coding language of choice. Another example is the mastery of other optimization software. For example, the students can learn to use the advanced features of Lingo, GAMS or other optimization software. (Python has optimization as well!) For this type of project, the students must prepare a video explaining what they learned. There may be other ways you can expand your knowledge, just make sure that your project topic is approved by the instructor. This will also prepare you for the Advanced Business Analytics course!
  3) *Discussion of an Existing Application:*
     In this type of project, the students may select a research or application paper – approved by the instructor – and prepare a presentation. You may contact the instructor to get help on finding papers. The same report and presentation requirements listed in project type 1 (novel problem) apply here.

     Each group must upload a video (or share a link to the video) of their project presentation. Groups may have up to 4 members.
- ***Final exam:*** The last lecture will be devoted to the **final exam (approximate duration: 3 hours)**. The exam will be in class.

While group members may share their work, they should not discuss or share assignments with other groups. Individual assignments must be completed individually.

The grade consists of 7 components shown in the table below.

Assignment	Learning Objectives	Weight
Video Exercises (Individual)	1 – 5	10%
Module Exercises (Group)	1 – 5	10%
Participation (Individual)		12%
Group Project	1 – 5	20%
Group Member Evaluation		5%
Final exam (Individual)	1 – 5	43%
Total		100%

Grading
The grade of A is reserved for those who demonstrate extraordinary performance as determined by the instructor. The grade of A- is awarded only for excellent performance. The grades of B+ and B are awarded for

good performance. The grades of B-, C+, C, and C- are awarded for adequate but substandard performance. The grades of D+, D, and D- are not awarded at the graduate level. The grade of F indicates the student's failure to satisfactorily complete the course work. For Core/Foundation courses, the grade point average of the class should not exceed 3.35. For Elective courses, the grade point average should not exceed 3.45.

Tentative Course Calendar
Instructors reserve the right to alter course content and/or adjust the pace to accommodate class progress. Students are responsible for keeping up with all adjustments to the course calendar.

Lecture	Content	Preparation for Flipped Class†		Deliverables
		Textbook, Notes	**Videos**	
1	a. Intro to Prescriptive Analytics and Linear Programming (LP) b. Mathematical Formulation of LPs (Product Mix, Multi-period Planning, Investment, Hobby Selection Problem)	Chapter 9.1 – 9.4 LP Formulation Video Exercises	LP Formulation Videos	Video Exercises (VE) 1 Module Exercises (ME) 1
2	a. Graphical Solution to LPs b. Solving LPs Using Excel's Solver	Chapter 9.1 – 9.4 Solving LPs Video Exercises	LP Graphical Solution Videos LP Solver Videos	VE 2 ME 2
3	Advanced LP: Understanding Solver answer report. LP Sensitivity Analysis: The effect of changes in the objective function and RHS coefficients.	Chapter 9.5 LP Sensitivity Video Exercises	LP Sensitivity Videos	VE 3 ME 3
4	a. Intro Integer Programming (IP) b. Binary Variables and Logical Constraints (Fixed Costs, Selection)	Chapter 11 IP Video Exercises	IP Videos	VE 4 ME 4
5	a. Network Flows (NF) (Assignment, Transportation, Transshipment Problems) b. Modeling Tricks for NF	Chapter 10 NF Video Exercises	NF Videos	VE 5 ME 5
6	a. Intro to Simulation b. Generating Random Numbers on Excel c. Disaster Planning, Bidding, Bootstrapping	Chapter 14 Simulation Video Exercises	Simulation Videos	VE 6 ME 6
7	a. Decision Analysis (DA) (Expected value, Expected utility, Decision trees) b. Advanced topics in decision analysis (Risk preferences, DA without probabilities (Maximax, Maximin, Minimax Regret)	Chapter 13 DA Video Exercises	DA Videos	VE 7 ME 7
8	Final Exam			Project Presentations
† The students must watch all videos and complete video exercises before each class.				

Note: Some topics included in the course may not be covered in the textbook. Some topics from other chapters not listed may be covered or pointed out for additional reading.

Carey Business School Policies and General Information

Please note that failure to become acquainted with Carey policies will not excuse any student from adhering to these policies.

Canvas Site
A Canvas course site is set up for this course. Each student is expected to check the site throughout the semester as Canvas will be the primary venue for outside classroom communications between the instructor and students. Students can access the course site at https://canvas.jhu.edu/.

Technical Support
24/7 technical support for questions regarding Canvas, Zoom, and other technical issues is available. Please refer to Carey's Academic Resources webpage for contact information and other details.

Students with Disabilities - Accommodations and Accessibility
Johns Hopkins University values diversity and inclusion. We are committed to providing welcoming, equitable, and accessible educational experiences for all students. Students with disabilities (including those with psychological conditions, medical conditions, and temporary disabilities) can request accommodations for this course by providing an Accommodation Letter issued by Student Disability Services. Please request accommodations for this course as early as possible to provide time for effective communication and arrangements. For further information or to start the process of requesting accommodations, please contact Student Disability Services at the Carey Business School.

Academic Ethics Policy
Carey expects graduates to be exemplary global citizens in addition to innovative business leaders. The Carey community believes that honesty, integrity, and community responsibility are qualities inherent in an exemplary citizen. The objective of the Academic Ethics Policy (AEP) is to create an environment of trust and respect among all members of the Carey academic community and hold Carey students accountable to the highest standards of academic integrity and excellence.

It is the responsibility of every Carey student, faculty member, and staff member to familiarize themselves with the AEP and its procedures. Failure to become acquainted with this information will not excuse any student, faculty, or staff member from the responsibility to abide by the AEP. Please contact the Office of Student Affairs if you have any questions. For the full policy, please visit the Academic Ethics Policy webpage.

Student Conduct Code
The fundamental purpose of the Johns Hopkins University's regulation of student conduct is to promote and to protect the health, safety, welfare, property, and rights of all members of the University community as well as to promote the orderly operation of the University and to safeguard its property and facilities. Please contact the Office of Student Affairs if you have any questions regarding this policy. For the full policy, please visit the Student Conduct Code webpage.

Commitment to Respect
Respectful behavior creates an environment within the Carey Business School where all are valued and can be productive. Carey defines respectful behavior as conduct that, at a minimum, demonstrates consistent courtesy for others, including an effort to understand differences. As such, all in the community agree to the Carey Commitment to Respect, which states that we all strive to show that we value each other's human dignity and our differences, and to choose behavior and language that demonstrates mutual respect. Please visit the Commitment to Respect webpage to learn more about the expectations and resources available.

Classroom Policies for All On-Site and Remote-Live Classes
Carey is committed to maintaining the highest standards of excellence in all forms of instruction. To that end, we have developed policies and procedures for all classes offered in on-site and remote-live formats. These policies will govern all courses occurring in these formats, and all students are expected to familiarize themselves with and adhere to these policies.

Student Success Center
The Student Success Center offers assistance in core writing and quantitative courses. For more information, visit the Student Success Center webpage.

Other Important Policies and Services
Students are encouraged to consult the Student Handbook and Academic Catalog and Student Services and Resources for information regarding other policies and services. For your convenience, there is a singular website students can visit to learn about all JHU and Carey policies.

Copyright Statement
Unless explicitly allowed by the instructor, course materials, class discussions, and examinations are created for and expected to be used by class participants only. The recording and rebroadcasting of such material, by any means, is forbidden. Violations are subject to sanctions under the Academic Ethics Policy.

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