Boston University Questrom School of Business

QST BA 472 Business Experiments and Causal Methods

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Office Hours: Tuesday and Thursday, 9:30 am – 11:30 am;
Wednesday 2:15 pm – 4:15 pm and by appointment
Course Assistant: To be announced

COURSE DESCRIPTION & LEARNING GOALS

When is making a change to a price, algorithm, or product worthwhile? Rather than relying on the gut intuition of a manager, businesses are increasingly using experiments and other forms of causal data analysis to answer these questions. In this class, we will learn about causal methods, when they work, how to implement them in Python, and how to apply them to digital markets. The business topics covered include pricing, balancing digital marketplaces like Airbnb and Uber, reputation systems, measuring influence in social networks, and algorithmic design.

There are two main goals for the course:

(1) Using experimentation tools for developing business decisions and strategies, and
(2) Developing and analyzing causal models in business settings.

PREREQUISITES: CAS CS 108 or CAS CS 111 or QST BA 222; CAS CS108 or CAS CS111 or QST BA222

COURSE STRUCTURE & PEDAGOGY

- The modules of this course include Experimental Design for Businesses, and Causal Analysis.
- We will follow an active learning strategy in which the goal is to "learn by doing".
- There will also be topics for which we will follow a flipped classroom method.
- Teamwork will be an important part of this course. This will include in-class and outside-the-class activities. I will inform you about what activities will be performed as a team or individually.

DIVERSITY, EQUITY, AND INCLUSIONS STATEMENT

- It is very important to me that all members of our community feel safe, welcome, and included. It is our responsibility to respect our peers, their viewpoints, and backgrounds.
- I invite you to share your personal experiences and perspective related to the course content. If there are topics or conversations that you feel would benefit from incorporation of social context, a differing perspective, or Questrom's Office of Diversity & Inclusion, please inform me and I will explore resources and opportunities for us to engage a wide variety of perspectives in our classroom.
- If you feel that there is something that impacts your experience, I'd like to know!

COURSE MATERIALS

- Lecture notes, exercises, and other relevant resources will be available on Blackboard.
- References will be shared on the course Blackboard page.
- These shared materials are copyrighted, and they are not to be published on public sites or shared with others.

COMMUNICATIONS

- I will communicate with you by posting announcements on Blackboard. Please check the course page at least once a day. Ideally, I recommend you check Blackboard once in the morning and once at night to stay up to date with the course.
- If I need to contact you individually, I will email your BU email address. If you need to communicate with me, please email me at nobaycik@bu.edu and allow 24 hours for a response. If you email me Friday evening through Sunday night, you may expect delays. I will do my best to reply as quickly as possible.

COURSE POLICIES

Attendance:

- Attendance in this course is defined as "being present in the classroom from beginning to the end of the class meeting time". However, if there is an emergency and you need to leave the classroom, please do so.
- Students are expected to attend each class session unless they have a valid reason for being absent. Students may be required at any time to account for undue irregularity in attendance, either by personal explanation to their faculty advisor or dean or by written statement from a parent or another authority. Any student who has been excessively absent from a course may be required to withdraw from that course without credit. Students who expect to be absent from class for more than five days should notify their dean promptly.
- Students absent from classes more than two days for illness should be under a doctor's care. Students who are absent five days or more for illness should present to Student Health Services a certificate of fitness from their physician or be examined at the University Clinic.
- The University observes the Massachusetts Religious absence law as set forth in the Policy on Student Absence due to Religious Observance, available at Marsh Chapel. Please see https://www.bu.edu/academics/policies/absence-for-religious-reasons/ for more details.

Recordings:

- Lecture recordings will be available on Blackboard (usually the same or next day). If you miss a class for any reason, please watch the recordings to stay up-to-date with the class.
- Students may not share these recordings with anyone not registered in the course and not repost them in any public platform.

Accommodations for Students with Special Needs

In keeping with University policy, any student with a disability who needs or thinks they need academic accommodations must call the Office of Disability Services at 353-3658 or stop by 19 Deerfield Street to arrange a confidential appointment with a Disability Services staff member. Accommodation letters must be delivered to me in a timely fashion (within two weeks of the date on the letter and not later than two weeks before any major examination). Please note that accommodations will not be delivered absent an official letter of accommodation.

Professional Conduct

This course will require you to use a computer during the lectures. Occasionally, there may be activities that will require you to use a smart device (e.g., smartphone, or tablet). All electronic devices must be used for course related purposes only.

Sexual Misconduct/Title IX Policy

The Questrom School of Business is committed to fostering a safe learning environment for all members of its community and preventing sexual misconduct. All forms of sexual misconduct, including rape, acquaintance rape, sexual assault, domestic and dating violence, stalking, and sexual harassment are

violations of Boston University's policies, whether they happen on campus or off campus. Title IX of the Education Amendments of 1972 is a federal civil rights law that prohibits sex-based discrimination in federally funded education programs and activities. This law makes it clear that violence and harassment based on sex and gender is a Civil Rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, etc. If you or someone you know has been harassed or assaulted, you can find the appropriate resources at http://www.bu.edu/safety/sexual-misconduct/.

PERFORMANCE EVALUATION

The relative weighting of assignments in your course grade is as follows:

Evaluation Activity	***Fraction of Course Grade***
Homework/Quizzes	35%
Team Project	15%
Exams	50%
TOTAL	**100%**

There will be absolutely no grade deflation in this course. (There will also, however, not be any grade inflation.) Final course grades will be the result of a direct mathematical computation, based on the formula above.

Description of assessment criteria:

- **Homework/Quizzes:**
  - There will be approximately eight to ten such assignments throughout the semester. The detailed instructions will be shared within the assignments. Unless otherwise noted, these assignments will be completed individually.
  - Homework assignments typically evaluate performance on topics that we have already covered in class.
  - Quizzes, on the other hand, can be in two different types: One type would be used in the implementation of the flipped classroom method. That is, these quizzes share a video or a reading task. After working on these, you are asked a number of questions similar to the content presented in the shared resources. The other quiz type would be a short assessment to test performance on a topic that we have covered in class.
- **Team project:**
  - As part of the course project**,** you will be asked to form a team of four to five students.
  - The assessment will include a short report and a presentation. You will have the option to choose your partner(s), and any unassigned student will be randomly assigned to a group that has openings.
  - Each group will submit one report.
  - Each group member will provide peer evaluations for each member of the group (including themselves). The average of these evaluations will be a percentage, which will be multiplied by the report grade, and this will be your adjusted report grade.
  - Each student will submit a presentation individually. That is, for a group of five students, there will be five separate presentations to be submitted.
- **Exams:**
  - There will be two exams – one midterm and one final exam.
  - You are allowed to use two-sided handwritten cheat sheet during the exam. No communications or searching questions online will be allowed.
  - The content of each exam will be announced on Blackboard in advance.

General Notes about Grading:

- If you have any questions about grades that you receive on a particular assignment, you must raise them within two weeks of receiving your grade on that assignment.
- Unless I have made computational errors, I will be unable to alter grades after final grades have been determined.
- If you have grade-related considerations that you think are important, please raise these as early as possible (during the first half of the semester at the latest!), so that I can help you approach the course in a way that will help you achieve your best possible performance.

Late Submission Policy:

- Submitting your homework within 24 hours of the deadline will lead to a 50% penalty.
- Submitting your homework between 24 hours and 48 hours of the deadline will lead to a 75% penalty.
- Submitting your homework 48 hours after the deadline will lead to not earning any points from the assignment.
- For Quizzes and Team Project, no late submissions will be accepted.
- Since the assignments of this course (homework and quizzes) will be posted in a way to give you multiple days to complete, there will be no make-ups for any of them. The only exception to this could be when there is a serious unexpected circumstance such as hospitalization.

Academic Integrity:

I follow the procedures of BU's Universal Academic Conduct Code for any clear evidence of an honor code violation. Cheating is, in the words of the Universal Academic Conduct Code, "any attempt by a student to alter his or her performance on an examination in violation of that examination's stated or commonly understood ground rules."

COURSE SCHEDULE

Below is a tentative course schedule. There may be minor changes as we make progress.

Week	Day	Date	Topic	Learning Goals
1	1	7-Sep	Introduction to Business Experiments and Causal Methods	Introduction to the purpose of business experiments
2	2	12-Sep	Python: Review and Basic Operations	Reviewing key tools, functions, and methods in Python that we will use for experiments, data and causal analysis
	3	14-Sep	Python: Review and Basic Operations	Reviewing key tools, functions, and methods in Python that we will use for experiments, data and causal analysis
3	4	19-Sep	Python: Review and Basic Operations	Reviewing key tools, functions, and methods in Python that we will use for experiments, data and causal analysis
	5	21-Sep	Statistics Review	Reviewing key statistical tools that we will use for experimental design.

4	6	26-Sep	Statistics Review	Reviewing key statistical tools that we will use for experimental design.
	7	28-Sep	Randomization	Random variables, expected value, standard deviation and variance
5	8	3-Oct	Experimental Design for Business, Analysis of Variance, and Hypothesis Testing	Understanding the steps of a business experiment, analyzing the impact of a single or multiple factors on some performance measure, measuring how good our estimates are in experiments; creating confidence Intervals, performing hypothesis tests
	9	5-Oct	Experimental Design for Business, Analysis of Variance, and Hypothesis Testing	Understanding the steps of a business experiment, analyzing the impact of a single or multiple factors on some performance measure, measuring how good our estimates are in experiments; creating confidence Intervals, performing hypothesis tests
6	10	11-Oct	Experimental Design for Business, Analysis of Variance, and Hypothesis Testing	Analyzing the impact of a single or multiple factors on some performance measure, measuring how good our estimates are in experiments; creating confidence Intervals, performing hypothesis tests.
	11	12-Oct	Experimental Design for Business, Analysis of Variance, and Hypothesis Testing	Analyzing the impact of a single or multiple factors on some performance measure, measuring how good our estimates are in experiments; creating confidence Intervals, performing hypothesis tests
7	12	17-Oct	Exam	-
	13	19-Oct	Regression for Experiments	Using regression to measure the average treatment effect, adding predictors to improve precision
8	14	24-Oct	Regression for Experiments	Using regression to measure the average treatment effect, adding predictors to improve precision
	15	26-Oct	Heterogeneity in Experiments	Understanding how each experimental unit responds to a treatment to give the best treatment to individual characteristics
9	16	31-Oct	Heterogeneity in Experiments	Understanding how each experimental unit responds to a treatment to give the best treatment to individual characteristics
	17	2-Nov	Describing Relationships and Causality	Describing the relationship between two variables and causality
10	18	7-Nov	Causal Models in Python	Using computer programming Python and its relevant libraries to build causal models
	19	9-Nov	Causal Models in Python	Using computer programming Python and its relevant libraries to build causal models
11	20	14-Nov	Project Consultation	
	21	16-Nov	Causal Models in Python	Using computer programming Python and its relevant libraries to build causal models
12	22	21-Nov	Project Consultation	-
	23	23-Nov	Thanksgiving Break - No Class	-

13	24	28-Nov	Causal Models in Python	Using computer programming Python and its relevant libraries to build causal models
	25	30-Nov	Causal Models in Python	Using computer programming Python and its relevant libraries to build causal models
14	26	5-Dec	Project Consultation	-
	27	7-Dec	Causal Models in Python	Using computer programming Python and its relevant libraries to build causal models
15	28	12-Dec	Concluding Remarks	-
	29	13-Dec to 21-Dec	Final Exams	-

Assignment Schedule:

Week 1: Quiz 0 due
Week 2: Homework 1 Due
Week 3: Homework 2 Due
Week 4: Homework 3 Due
Week 5:
Week 6: Homework 4 Due
Week 7: Midterm Exam
Week 8: Homework 5 due
Week 9: Homework 6 Due
Week 10:
Week 11: Homework 7 Due
Week 12:
Week 13: Homework 8 Due
Week 14: Project Deliverables Due
Week 15: Final Exam

Note: Quizzes may replace any of the above homework assignments. The due dates or the types of the assignments may change.

Changes to Syllabus:

If there are any changes, I will let you know through Blackboard announcements.