Course Description, Requirements & Syllabus
QNT 2020: Foundations of Predictive Analytics and Decision Modeling

Semester	Spring 2025
Course & Section	QNT 2020 – DMWA
Class Days/Times	Monday 12:50 PM – 2:05 PM, Online (Zoom Link)
	Wednesday 12:50 PM – 2:05 PM, 17 LEX-1220
Department	Narendra Paul Loomba Department of Management
Instructor	Yuan-Mao Kao
Contact	(646) 312-3681
Email	yuan-mao.kao@baruch.cuny.edu
Office	NVC 9-253
Office Hours	Wed 2:30 PM – 3:30 PM or by appointment

PLEASE READ THIS SYLLABUS IN ITS ENTIRETY.

1. Your participation in this course (QNT 2020) implicitly confirms your full and unconditional acceptance of:
   - Course terms and conditions as outlined in this syllabus.
   - All associated Baruch College regulations.

2. All course communication will be done via Brightspace. Please note that the default email on Brightspace is your **CUNY email**. Make sure your email account is set up to the CUNY account (xxxx@login.cuny.edu); otherwise, you will not receive notifications about the course.
   - To change the Brightspace notification settings: click your name on the top right corner of Brightspace) → Notifications

Course Description

Students will develop quantitative reasoning skills necessary for success in business. Proficiency in the foundations of predictive analytics and decision modeling is the central focus. Students will learn to model a wide range of business decisions through case studies, data analysis, spreadsheet modeling, and interpretation of business significance. Students will further develop their statistical thinking skills through the study of predictive modeling for business using multiple regression. Variation, interpretation of models and model output, model building with spreadsheets, and regression assumption checking are stressed. Throughout the course, students will build quantitative literacy skills through writing about analytics, model building, and interpreting quantitative information to understand and use data in managerial decisions. *3.0 hours; 3.0 credits.*

Prerequisites

Completion of math requirement for the BBA degree (MTH 2000/2001/2003/2009) or equivalent, and STA 2000.

Course Objectives

Upon completing QNT 2020, a student will be able to do the following:

1. Use quantitative reasoning skills needed to interpret data and statistical analyses to solve business problems.
2. Employ statistical methods and multiple linear regression to analyze data and make predictions for business.
3. Design, build, and test quantitative models for business decision-making using spreadsheets and other technologies.
4. Interpret and communicate quantitative and statistical information to enable managerial decisions.

How the Course Is Organized

This course has both synchronous components and asynchronous components.

- **Synchronous Component:** The synchronous components will be covered during the class times twice per week. This course is designated as a hybrid course. For the synchronous online lectures on Mondays, please use the following Zoom link to attend the classes virtually:
  - https://baruch.zoom.us/j/89597638616
  - Passcode: 678426

  Students are expected to attend all lectures because they will work in groups for a portion of the lectures. Please let me know in advance if you are unable to attend any of the lectures.
- **Asynchronous Component:** The asynchronous components are required readings, quizzes, assessments, and group work. To achieve the desired learning outcomes of this course, it is mandatory to complete all readings, homework, and quizzes as provided in the course schedule.
  - **Readings:** you must complete the readings and take the practice questions assigned to receive full credit. Reading grades are counted towards your final grade.
  - **Group Work:** you must form small groups (6 per group) by the end of the second week. You are required to submit your group members to me by the end of week 2.

Textbook & Course Materials

1. **Required Textbooks:** McGraw Hill has prepared a custom book for Baruch students. *LSC (BARUCH COLLEGE) QNT 2020: CUSTOM SITE ECOMM PPK Connect Online Access for Business, Economics, Management Science 180 Day Access ISBN: 9781265610166*

This custom textbook takes select chapters from the following two textbooks:

a) *Essential Statistics in Business and Economics*, 3rd ed. with Connect by Doane & Seward. (McGraw Hill, 2020, ISBN 978-1-260-23950-8), **Chapters 3, 4, 7, 8, 9, 12, 13 only**.
b) *Introduction to Management Science: A Modeling and Case Studies Approach with Spreadsheets*, **7th ed**. with Connect by Hillier & Hillier (McGraw Hill, 2022, ISBN 978-1-265-46281-9), **Chapters 1, 5, 6, and 11 only**.

Students can either purchase the textbook via the bookstore or directly through your Connect course:

i. Connect with digital access to eBook: $78.00
ii. Connect with digital access to eBook + looseleaf print: $88.00

You can purchase it through our Connect Course Website as below:
https://connect.mheducation.com/class/y-kao-spring-2025---section-dmwa-19903

Please note any other option purchased will be at a higher price. Moreover, we are using a new edition of the textbook, so other links you find maybe for an old version, which may fail to access our Connect Course Website. Please contact me if you wish to purchase another option from MGH.

2. **Required Digital Platform: Connect**
We will use the textbook's digital platform, Connect, for all assignments. To register your Connect account, please see the registration guide below:

http://video.mhhe.com/watch/bNWGudKsUBbe8DArNRKomk

The course website on McGraw Connect has been paired with Brightspace. Once you have registered your account, you will be able to access your assignments directly from the course Brightspace page. If you have any trouble registering, you can contact customer support at 1-800-331-5094 or through their website:

https://mh.my.site.com/CXG/s/ContactUs.

Grades and Expectations from Students

The course is structured around a combination of class lectures, hands-on exercises on quantitative literacy, and individual and group assignments. Students are expected to read the assigned readings in advance, submit the assignments on time, and actively participate in the classroom.

Overall class grades will be based on the following weights:

Components	Points	Weights
Assessments – Readings	100	10%
Assessments – Homework	300	30%
Group Projects	300	30%
Midterm Exam	150	15%
Final Exam	150	15%
TOTAL	1,000	100%
Class Participation	30	3%
TOTAL EXTRA Credits	30	3%

Online Assessments: Students will be expected to complete weekly online assessments. Assessments (readings, homework, and quizzes) will either be conducted through a publisher's platform, such as McGraw Hill Connect, or through Brightspace. Unless otherwise announced, all online assessments can be accessed from QNT2020 Course Brightspace → Content → McGraw Hill Connect.

Projects: Students will complete two modeling projects that require them to use all that they have learned about multiple regression and decision modeling and then form a management decision. Emphasized in the project are (a) correct application of modeling techniques, (b) appropriate interpretation of the model results in words that are appropriate for your manager or client, and (c) clear, concise, and appropriate written managerial recommendations. Details of the project assignments and grading rubrics will be posted on Brightspace.

Exams: Exams will consist of multiple-choice and/or problem-solving questions. All exams will cover material from all aspects of the class sessions (lectures, videos, in-class work, and so forth). More details will be announced on Brightspace.

Attendance and Participation: Students are expected to attend all classes, read the assigned readings before the lectures, and participate actively in class sessions. Attendance and participation are important elements of the class. Your participation grade will be based on your responses during the question-and-answer part of the lecture, as well as your active contribution during the group work.

For all assignments, no late submission is accepted. For assignments requiring teamwork, you must contribute your fair share to receive a full grade. Any disputes will be addressed on a case-by-case basis. If the team member does not contribute to the group project in a fair manner, that member will not receive the same grade as the rest of the team for the project.

Final Letter Grades

Letter grades are assigned according to the Official Grading System of Baruch College (please see https://baruch-undergraduate.catalog.cuny.edu/policies-and-procedures/understanding-your-grades-and-transcript). To facilitate learning, I reserve the right to curve the exam scores and/or final grades.

Accumulated points will be calculated as a percentage and reported as a letter grade using the following scale (source: Baruch College Faculty Handbook).

% of Points Earned	Letter Grade	GPA Value
≥ 93.0%	A	4.0
90.0% - 92.9%	A-	3.7
87.1% - 89.9%	B+	3.3
83.0% - 87.0%	B	3.0
80.0% - 82.9%	B-	2.7
77.1% - 79.9%	C+	2.3
73.0% - 77.0%	C	2.0
70.0% - 72.9%	C-	1.7
67.1% - 69.9%	D+	1.3
60.0% - 67.0%	D	1.0
< 60.0%	F	0.0

A summary of my grading rules and expectations follows.

1. Classes start and end on time.
2. I don't accept anything late.
3. Cheating and plagiarism are not tolerated and have severe consequences. Please read the section on Academic Integrity.
4. If you don't follow my instructions, you will not be given a second chance to do it right.

General Course Policies

Exam Policy:

- Students should be aware of all the important dates of this course (especially the midterm and final exams). Students are responsible for organizing work and life activities and avoiding conflicts with those important dates.
- Make-up exams disrupt and draw resources away from normal operations, and thus they are discouraged. In exceptional circumstances (e.g., emergent medical issues), make-ups may be allowed at the instructor's discretion, provided:
    a) The request is received by the instructor **before the exam**.
    b) Acceptable written justification/documentation to verify the reason for the make-up request or a confirmation from the Dean of Students.
- Make-up exams may be more demanding in content and scope relative to scheduled routine exams. Both administration and grading of make-up

exams may be delayed, depending on resource availability. Grade penalties (at the discretion of the instructor) may also be applied for make-up exams.
- The final exam must be taken in the time slot posted in the college bulletin.
- The exams will include materials from both the readings and the topics covered during our class sessions.
- Behavior during exams is expected to conform to Baruch College guidelines. Any form of cheating or communication with other students or any other incident of improper behavior will be dealt with according to the guidelines established by the College.

Work Submission Standards:

- Assignments are considered on time only if they are submitted by the due date/time as per the submission guidelines.
- Hand-written work will be refused and will earn no credit unless otherwise instructed. As with any other academic submission, students must do their work carefully, striving to achieve high-quality work. This includes writing clearly, checking the spelling and grammar, proofreading the submissions, and handing in the work on the specified due date.
- Extensions can be granted for situations involving illness, family, or personal emergencies. If you need an extension, you must request one via e-mail **before the due date of an assignment**. **No extensions will be granted after the due date.**
- For individual assignments or group projects, any instance of copying, cheating, or plagiarism will be penalized, and such instances will be reported to the Dean of Students. **Consequences may range from an F in the specific assignment to an F in the course. Please read the section on Academic Integrity.**
- Although artificial intelligence (AI) services, such as ChatGPT, are allowed in this course, please note that publicly available AIs are still not accurate enough, especially in quantitative analyses. You may easily receive incorrect answers, and if your answers resemble those of others, they could be seen as copying or plagiarism. You can use AI tools to assist with brainstorming or to refine your writing; however, you are responsible for fully understanding all your writing and analyses in the assignments. This is essential in case I need to verify that the work is done by you and not generated by AIs.

Additional Notes:

- Feel free to ask me why you received a certain grade on an assignment or exam. If you received a grade in error, I will correct it. If not, and you still want to dispute the grade, I will consider re-grading requests, but I will regrade the entire assignment or exam. This could result in a grade that is the same, higher, or lower.
- Let me know about any problems or issues, such as missing class, long-term illnesses, job-related problems, problems with the groups, etc., as soon as possible.

- Please do not ask for redoing assignments or any other extra points to boost your grades. Such a request will be considered failing to read this syllabus carefully and may affect your class participation points.

Student Tutoring Services

Baruch's Student Academic Consulting Center (SACC) helps more than 5,000 students each year in a wide range of subjects and employs more than 100 students as peer tutors. Tutors will be available to assist QNT 2020 students. If you feel you are having difficulties learning the material that cannot be rectified during my normal office hours, consider the tutoring option. For more information, please see http://www.baruch.cuny.edu/sacc.

Audio & Video Recording Policy

In some cases, online synchronous sessions may be recorded. Students who participate in this class with their camera on or use a profile image agree to have their video or image recorded solely for the purpose of creating a record for students enrolled in the class to refer to, including those enrolled students who are unable to attend live. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who unmute during class and participate orally agree to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live.

Attendance

All students are required to attend every session of their courses. If a freshman or sophomore is absent in excess of twice the number of class sessions per week, the instructor must give the student a WU grade, which counts as an F. **The instructor may give a junior or senior a WU grade (the equivalent of an F) for excessive absences.** The Registrar's Office requires that students who have attended no classes before week 5 be dropped from the class.

Withdrawals

Withdrawals must be done in accordance with Baruch College policies. Please visit http://www.baruch.cuny.edu/registrar/due_dates.htm for important due dates.

Students with Disabilities

Baruch has a continuing commitment to providing reasonable accommodation for students with disabilities. Students with disabilities who may need accommodation

to fully participate in this class should contact Student Disability Services as soon as possible at disability.services@baruch.cuny.edu. For more information, please see https://studentaffairs.baruch.cuny.edu/student-disability-services/, visit the office in NVC 2-271, or contact (646) 312-4590.

Academic Integrity

Cheating and plagiarism are serious offenses. The following definitions are based on the College's Academic Honesty website:

Cheating is the attempted or unauthorized use of materials, information, notes, study aids, devices, or communication during an academic exercise. Examples include but are not limited to:

- Copying from another student during an examination or allowing another to copy your work
- Unauthorized collaborating on a take-home assignment or examination
- Using unauthorized notes during a closed-book examination
- Using unauthorized electronic devices during an examination
- Taking an examination for another student
- Asking or allowing another student to take an examination for you
- Changing a corrected exam and returning it for more credit
- Submitting substantial portions of the same paper to two classes without consulting the second instructor
- Preparing answers or writing notes in a blue book (exam booklet) before an examination
- Allowing others to research and write assigned papers, including the use of commercial term paper services

Plagiarism is the act of presenting another person's ideas, research, or writing as your own, such as:

- Copying another person's actual words without the use of quotation marks and footnotes (a functional limit is four or more words taken from the work of another)
- Presenting another person's ideas or theories in your own words without acknowledging them
- Using information that is not considered common knowledge without acknowledging the source
- Failure to acknowledge collaborators on homework and laboratory assignment
- **Posting exams, quizzes, case questions or assignments, and/or related solutions/answers, or looking up on Chegg and any other similar online site would be an infringement of course and Baruch academic honesty and integrity policy.** Please be aware that Baruch has the capability to track such actions and identify offenders – they have done so in the past.

My policy is to give a failing grade (or zero points) to any assignment that has been plagiarized or an exam in which you have cheated. **These include group assignments.** In addition, I am required by college policy to submit a report of suspected academic dishonesty to the Office of the Dean of Students. This report becomes part of your permanent file.

Students are also expected to follow the Baruch College Code of Student Conduct, which clearly states the following:

The sale or purchase of term papers, student essays, reports, and other written assignments intended for use in credit courses is prohibited. Purchases from commercial term paper firms for use as course papers are illegal and subject a student to disciplinary proceedings.

Any violations, however minor, of these codes of conduct, would be reported to the Office of the Dean of Students.

BBA Learning Goals Addressed

The faculty of the Zicklin School of Business has adopted the following "Learning Goals" for BBA students. The purpose of these goals is to create a common understanding between students, faculty and potential employers of the core objectives for a business education. The seven goals, together with assessment criteria, can be viewed at

http://zicklin.baruch.cuny.edu/zk/resources/teaching/aol/undergraduate/bba

The following Zicklin BBA Learning Goals will be addressed in this course:

1. **Analytical Skills:** Students will possess the analytical and critical thinking skills to evaluate issues faced in business and professional careers.
2. **Technological Skills:** Students will possess the necessary technological skills to analyze problems, develop solutions and convey information.
3. **Communication Skills (Oral):** Students will have the necessary oral communication skills to convey ideas and information effectively and persuasively.
4. **Communication Skills (Written): S**tudents will have the necessary written communication skills to convey ideas and information effectively and persuasively.
5. **Civic Awareness and Ethical Decision-making:** Students will have the knowledge base and analytical skill to guide them when faced with ethical dilemmas in business. Students will have an awareness of political, civic and public policy issues affecting business.
6. **Global Awareness:** Students will know how differences in perspectives and cultures affect business practices around the world.

7. **Proficiency in a Single Discipline:** Students will possess a deep understanding of and intellectual competence in at least one business discipline.

Course Mapping with Learning Goals

BBA Learning Goals	Significant Part of the Course	Moderate Part of the Course	Minimal Part of the Course	Not Part of the Course
Analytical Skills	x			
Technology and Data Literacy	x			
Communication Skills: Oral		x		
Communication Skills: Written	x			
Civic Awareness & Ethical Decision-Making			x	
Global Awareness			x	

Assignments	*Course Learning Goals*	*BBA learning goals*
Online assessments, projects, and exams.	Use quantitative reasoning skills needed to interpret data and statistical analyses to solve business problems.	• Analytical skills, Technological skills • Oral and written communication skills
Online assessments, projects, Excel activities, and exams	Design, build, and test quantitative models for business decision-making using spreadsheets and other technologies.	• Analytical skills, Technological skills
Online assessments, projects, and exams.	Employ statistical methods and multiple linear regression to analyze data and make predictions for business.	• Analytical skills, Technological skills • Oral and written communication skills.
Projects and class discussions.	Interpret and communicate quantitative and statistical information in order to enable managerial decisions.	• Analytical skills, Technological skills • Oral and written communication skills • Global awareness • Civic awareness, ethical decision-making

Tentative Course Schedule

QNT 2020 Course Schedule – Spring 2025 (January 25 – May 25)			
Class	**Learning Objectives**	**Topics**	**Deliverables**
1 01/27	Introduction		
	• Course syllabus: structure of the course, outline, expectations • Review: Introduce students to datasets and build descriptive summary statistics. Review measurements taken from sample and population. • Describe the properties of central tendency, variation, covariance, and shape in numerical data.	Introduction	**Setting up your McGraw Hill Connect account.** **Self-Review Doane & Seward Ch 3 & 4 (Visually & Numerically Describe Data)**
2 – 3 02/03 02/05	Statistical Foundations of Predictive Modeling: Continuous Distributions		
	• Use the normal distribution to solve business problems. • Understand the normal probability plot • Understand the standard normal distribution and the standard score • Compute probabilities from the normal distribution.	Doane & Seward, Ch 7 Continuous Distributions	**Do Chapter 7 Reading Assignment**
4 – 5 02/10 02/18	Statistical Foundations of Predictive Modeling: Sampling Distributions		
	• Describe a sampling distribution. • Compute probabilities related to the sample mean and the sample proportion. • Explain the Central Limit Theorem. • Build and interpret confidence interval estimates for the mean and the proportion	Doane & Seward, Ch 8 Sampling Distributions	**Do Chapter 8 Reading Assignment** **HW 1: "Probability Distributions"**
6 – 8 02/19 02/24 02/26	Statistical Foundations of Predictive Modeling: Hypothesis Testing and Confidence Intervals, ANOVA		
	• Build and interpret hypothesis tests to test a mean or proportion • Understanding the assumptions and pitfalls of hypothesis testing. • Testing means of more than two samples • Identify sources of variation to potential explanatory variables using ANOVA method	Doane & Seward, Ch 9 & 11 Hypothesis Testing ANOVA	**Do Chapter 9 & 11 Reading Assignment** **HW 2: "Sampling Distributions"**

9 – 10 03/03 03/05	Statistical Foundations of Predictive Modeling: Linear Regression Uncertainty of Model Predictions		
	• Use simple linear regression analysis to evaluate the significance of a dependent variable. • Make inferences about the slope, correlation coefficient, and R-squared. • Interpret T-tests on model coefficients and interpret the managerial significance of p-values • Estimate mean values and predict individual values. • Determine when it is valid to infer that one thing causes another: causation vs. correlation. • Describe how simple regression is conducted and analyzed in MS-Excel 3 ways: the Data Analysis ToolPak, "Add Trendline", and TREND and FORECAST functions.	Doane & Seward, Ch 12 Simple Regression	**Do Chapter 12 Reading Assignment** **HW 3: "Hypothesis Testing & ANOVA"**
11 – 15 03/06 03/10 03/12 03/17 03/19	Statistical Foundations of Predictive Modeling: Linear Regression Uncertainty of Model Predictions (Cont.)		
	• Explain the multiple regression model and the related least squares point estimates. • Interpret the managerial significance of model coefficients. • Compute and interpret the multiple and adjusted multiple coefficients of determination; R-squared and adjusted R-squared. • Explain the assumptions behind multiple regression; compute the standard error. • Test the overall significance of a multiple regression model with an F test. • Build and interpret a multiple regression model using the MS-Excel Data Analysis ToolPak. • Incorporate categorical "dummy" variables to model qualitative independent variables. • Interpret the meaning of dummy variables in a regression model. • Build a nonlinear model and perform basic tests for nonlinearity. • Analyze multiple regression, nonlinear regression, and models with categorical data in MS Excel Data Analysis ToolPak. • Analyze residuals to check the assumptions of multiple regression. • Practice model evaluation on various data sets in MS Excel.	Doane & Seward, Ch 13 Multiple Regression Project 1 Discussion	**Do Chapter 13 Reading Assignment** **HW 4: "Regression Models"**

16 03/24	Introduction to Business Decision Modeling		
	• Describe the difference between predictive analytics (multiple regression) and prescriptive analytics (optimization). • Walk through an example to show how optimization methods complement predictive analytics (see the VRX case in Section 1.4).	Hillier & Hillier, Ch 1 Introduction	**Do Chapter 1 (H&H) Reading Assignment** **Read the VRX case**
17 03/26	Midterm Exam (In-Person)		
18 – 20 04/02 04/07 04/09	Business Decision Modeling: Basic Concepts		
	• Explain mathematical decision models. • Understand the difference between deterministic and uncertain/risky business problems; simultaneous (one-time) vs. sequential decisions. • Explain what a (linear) decision model is. • Identify the key questions to be addressed in formulating any decision model: Decision variables, problem data, objective function, and constraints. • Build a linear decision model in algebraic form and in a spreadsheet (starting from a problem description and data). • Present the algebraic form of a (linear) decision model from its spreadsheet formulation, and vice versa. • Apply the graphical solution and explain a 2-variable linear decision problem. • Develop intuition for spreadsheet solutions from the graphical solution. • Name and identify the purpose of the 4 kinds of spreadsheet cells used in (linear) decision spreadsheet models. • Use MS Excel Solver to solve (linear) decision models. • Practice modeling a variety of multiple decision problems.	Hillier & Hillier, Ch 5 Linear Programming: Basic Concepts	**Do Chapter 5 (H&H) Reading Assignment** **Project 1: Multiple Regression Modeling Assignment.** **HW 6: "LP Models"**
21 – 22 04/21 04/23	Business Decision Models: Formulation and Applications		
	• Describe 5 major categories of linear decision problems, including their identifying features. • Formulate linear decision models in MS Excel from a (text) description of any of the above categories. • Describe the differences among resource constraints, benefit constraints, and fixed-requirement constraints, including how they arise. • Identify the 4 components in a linear program and the kind of spreadsheet cells used for each component.	Hillier & Hillier, Ch 6 Linear Programming: Formulation and Applications	**Do Chapter 6 (H&H) Reading Assignment**

23 – 24 04/28 04/30	Advanced Decision Modeling: Integer Programming		
	• Understand the difference between continuous and integer decision variables. • Describe when to use integer programming and when it suffices to use linear programming instead. • Formulate a mixed-integer linear program in MS Excel. • Describe how integer programming can be helpful to build various constraints. • Practice different examples based on mixed-integer linear programming	Hillier & Hillier, Ch 10 Integer Programming	**Do Chapter 10 (H&H) Reading Assignment** **HW 5: "Decision Models"**
25 – 27 05/05 05/07 05/12	Advanced Decision Modeling: Nonlinear Optimization		
	• Describe the differences between nonlinear and linear decision models. • Explain the difference between solving nonlinear optimization problems with (pre)calculus vs. with nonlinear (spreadsheet) decision models. • Recognize when a nonlinear model is needed to represent a business decision. • Formulate a nonlinear decision in MS Excel model from a business problem description. • Use MS Excel Nonlinear Solver to solve simple types of nonlinear decision problems.	Hillier & Hillier, Ch 11 Non-Linear Programming	**Do Chapter 11 (H&H) Reading Assignment** **Project 2: Decision Model Assignment**
28 05/14	Course Review		

PLEASE NOTE: The schedule is subject to change. All changes will be announced on Brightspace. Any class cancellations will be announced on Brightspace (this is the only official source of announcements for the class).