NJIT

MARTIN TUCHMAN
SCHOOL OF MANAGEMENT
NEW JERSEY INSTITUTE OF TECHNOLOGY

# Business Research Methods
# MGMT 316
# Fall 2024

**Instructor: Dr. Jim Shi**
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**Class Time & Location:**

| Section Number | Classroom | Meeting Time | Weekday |
|---|---|---|---|
| 001 | **CAB 3052** | 2:30 PM - 3:50 PM | Tuesday/Thursday |
| 101 | **CKB 124** | 6:00 PM - 7:20 PM | Tuesday/Thursday |

**Prerequisites:** MGMT 216 - Business Statistics; MIS 245 - Management Information Systems.
**Class Website:** Canvas.njit.edu (select MGMT316) for course materials
**Office Hour:** 4-6pm Tuesday, or other time via appointment,
**ZOOM Link:** https://njit-edu.zoom.us/my/jmshi

**Proposed Catalog Description:**

This course provides an introduction to management research methodologies and tools with an emphasis on data collection, data analysis and related applications. It provides students with the knowledge and skills to conduct business research in all applicable fields from the traditional areas of business, such as marketing, finance, human resources, operations management, and service management, to web-based e-commerce related research applications, etc. This course covers theories and techniques to successfully conduct business research studies. Upon course completion, students will acquire the skills to:

(1) develop an understanding of business research methodologies,
(2) design and execute business research studies,
(3) analyze qualitative and quantitative data derived from research studies, and
(4) develop the ability to present the results, analyzes and recommendations to management.

**Text: Optional**

[1] Donald Cooper, Pamela Schindler, *Business Research Methods*,12th edition, McGraw-Hill, ISBN: 0073521507, ISBN-13: 9780073521503

[2] David R. Anderson, Dennis J. Sweeney, Thomas A. Williams, Jeffrey D. Camm, and James J. Cochran, *An Introduction to Management Science: Quantitative Approach* 15th Edition, Cengage Learning; (January 1, 2018), ISBN-10: 133740652X, ISBN-13: 978-1337406529

[3] Christian Albright and Wayne L. Winston, *Spreadsheet* Modeling and Applications: Essentials of Practical Management Science, 1st Ed., South- Western College Pub, 2004, ISBN-10: 0534380328, ISBN-13: 978-0534380328.

**Software (Required):**

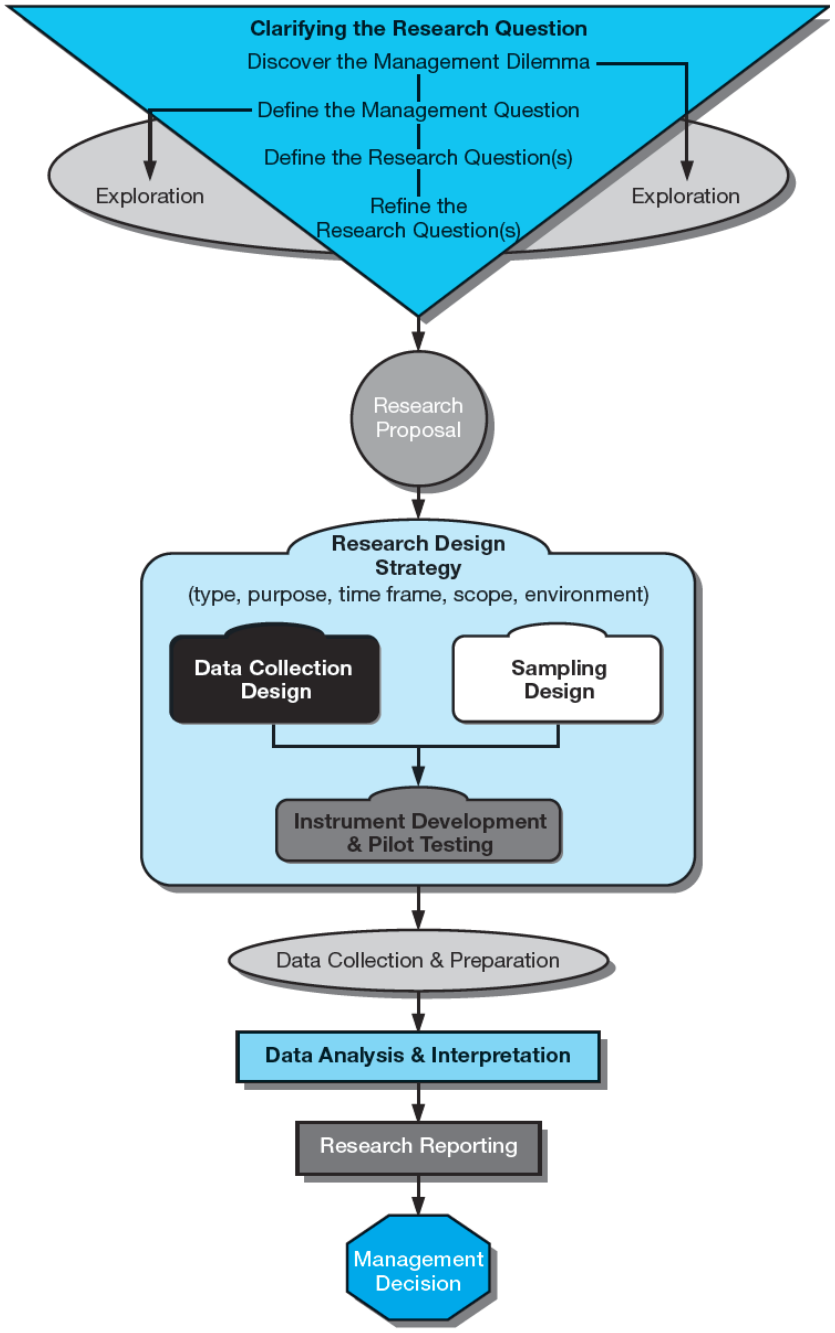
| | |
|---|---|
| **Microsoft Excel**  | Available as part of Microsoft Office 2019 or Excel 2021, Office 365 and subsequent;<br>Office: Mac 2016 for newer version (Mac OS);<br>Free download at NJIT Software Downloads.<br>Please be aware of the differences among versions in features and layout. We shall use Excel 2019, or 2021, or Excel 365 for Windows OS.<br>If needed, please take the advantage of on-campus computers. |

**Course Scope and Content**

Research is any organized inquiry carried out to provide information for solving problems. This includes reporting, descriptive, explanatory, and predictive studies. Business research is a systematic inquiry that provides information to guide decisions. More specifically, it is a process of determining, acquiring, analyzing and synthesizing, and disseminating relevant data, information, and insights to decision makers in ways that mobilize the organization to take appropriate actions that, in turn, maximize performance. The process of conducting a business research is depicted as below in the Exhibit.

This course is focused on the research process and the scientific method. It covers how knowledge is generated, disseminated, and evaluated. We begin with a discussion of the philosophy of science, and then turn to the methods through which scientific theories are tested. These methods involve the use of statistics, and we will cover statistical analyses as applied to hypothesis testing.

**Exhibit: General Process of Business Research**




This course is designed to build the foundation skills necessary to design, conduct and evaluate business research. Successful completion of the course will provide the knowledge to master three activities that define a doctoral level scholar and/or practitioner:

- Learn a common language and develop values that are required to generate and disseminate business research in a manner consistent with the norms and expectations of a management professional. Remember

that you are being educated to become a business analysis or manager, and it is necessary to act and think like one.

- Evaluate the methodological adequacy of empirical studies for yourself, peers seeking feedback, students, and journal editors.

- Design and conduct your own research while appreciating both its value and limitations.

Aligning with the prevailing business research, course content is geared toward emerging analytical methods and advanced analysis of existing methods. To this end, we introduce a variety of data-driven research topics, enriched with real business applications. In particular, this course covers the development, implementation, and utilization of business models for managerial decision making. Various techniques for analytical modeling, such as statistical analysis, forecasting, optimization, simulation, decision analysis, and classification, are discussed. Students gain mastery in developing complex financial models implemented in decision support systems that cover applications in strategic planning, financial management, operations/project management, marketing research, etc.

Course content is at times abstract and at times somewhat technical. This course is typically characterized as "difficult" or "challenging," and to some degree, these characterizations are accurate. There is no reason to approach the course with fear and trembling, and every student has the opportunity to excel. To so, however, requires commitment and dedication. This is not a course where you can let things slide and then "catch up."

**Course Mechanics**
Each week we will cover an aspect of the research process. Core reading will be assigned one week in advance and students are required to be conversant with core material. Additional required readings that are relevant to the class will also be announced in advance.

Readings for discussion will also be announced in advance. It is imperative that you be prepared to discuss them in detail, and link that discussion to course concepts. Coming to class unprepared (or not all) is not a good strategy for success.

**Attendance/Class Participation/Homework:**
Your class participation is very important, and the participation grade will be mainly based on attendance, class discussion, Q/A response, etc. All homework assignments will be reviewed in class, but homework will not be collected. You are expected to attend classes. Class attendance will be taken in the beginning of class. If you do miss a class, you are responsible for obtaining notes and remaining current. It is not possible to repeat lectures for students missing class. One "free" absence is allowed. There are no "excused absences." It is clear that the final grade will be an "F" if you missed FIVE or more attendances. **The Attendance will be alternatively tracked at Canvas**.

Late students are responsible for signing the class roll at each class meeting before leaving. Otherwise, you will be considered absent. Excessively late students and students leaving early will be penalized. If you arrive late, it is ***your*** responsibility to remember to sign the roll before you leave.

***All pagers, cell phones should be turned off or muted during class.***

***All pagers, cell phones and smart devices (e.g., Apple Watch) should be turned off during tests.***

***Lab computer is for lecture purpose only; checking emails or other internet actions are firmly prohibited. This will be counted as a part of class attendance.***

**General Course Objectives:**
To demonstrate the application of models in support of decision making in an enterprise, using some of the most commonly used modeling approaches and principles. Upon completion of the course, the student should:

- Demonstrate competence in analysis/development of some common models mathematically
- Demonstrate competence in analysis/development of some common models graphically
- Demonstrate competence in using a spreadsheet for analysis
- Interpret model results in the context of the business situation and explain in plain language

**Specific Course Objectives:**
Upon completion of the course, the student should be able to:

**General Modeling:**

- Define basic modeling terms, including (but not limited to) Physical model, Analog model, Symbolic model, Deterministic model, Probabilistic model, Decision Variable, Random Variable, Parameter, Performance measure, Objective function, Revenue, Fixed Cost, Variable Cost, Overhead Cost, Sunk Cost, Demand, Price, etc.
- Explain the modeling process, including model types, data collection, analysis, interpretation
- Analyze a business situation to identify revenues, costs, and other relevant parameters
- Draw an influence diagram to map the relationships between different variables of interest
- Build a basic profit model both with a spreadsheet and without
- Perform Breakeven and Crossover analysis algebraically and graphically, both with a spreadsheet and without, and interpret the results of each

**Simulation**

- Compare and contrast simulation with other types of modeling
- Determine when simulation is an appropriate technique to use
- Use random numbers from a random number table or a spreadsheet function
- Apply simulation techniques to machine break-down, queuing, and inventory problems
- Graph and interpret the results of the simulations

**Optimization:**

- Simple linear optimization models: objective function and constraints

- Use Solver to solve real business problems, e.g., maximizing profit or minimizing cost
- Sensitivity analysis for managerial insights, generating report by Solver
- Network optimization applications
- Real projects of business applications

**Decision Analysis**

- Differentiate between decision making under ignorance, risk, and certainty
- Define the terms Decision Alternative, States of Nature, Payoff
- Compute payoff matrix for a given business scenario
- Define the criteria for choosing the best decision
- Determine the best decision using the MAXIMAX, MAXIMIN
- Compute Expected Value (EV or ER), EV under/with Perfect Information (EVUPI or EVwPI), and EV of Perfect Information (EVPI)
- Construct and solve a decision tree by assigning payoffs to branches, pruning of branches at decision nodes, and assigning probabilities and calculating expected values at chance nodes
- Combine sample data with prior probabilities using Bayes' Theorem, and incorporate these "posterior" probabilities into a decision tree analysis

| **Grading:** | | **Points** |
|---|---|---|
| Competency Exercise (Excel Spreadsheet Analysis) - Required! | | 0 |
| Tests | 2 Tests (10 pts. each) | 20 |
| Projects | 3 Projects (10 pts. each) | 30 |
| Homework | 9 Assignment (5 pts. each) | 45 |
| Attendance | (Canvas check in will be tracked) | 5 |
| Sum | | 100 |

Please note that NJIT recommended grading scheme is as follows:

| | |
|---|---|
| **A** | for Superior performance (90% or higher) |
| **B+** | for excellent performance (87 to 89.99%) |
| **B** | for very good performance (82 to 86.99%) |
| **C+** | for acceptable performance (76 to 81.99%) |
| **C** | for fair performance (70 to 75.99%) |
| **D** | for minimal performance (65 to 69.99%) |
| **F** | Otherwise. |

Professional and personal circumstances that preclude you from performing at satisfactory levels will not be considered in the determination of the course grade. The effect of your grade on overall GPA, eligibility for graduation, loss of scholarship, loss of a United States resident card, placement on academic probation, etc., are *not* considered in the determination of your grade. There are no extra credit assignments. Individual requests for alternative ways to improve your course grade will not be considered.

**There will be no makeup exam, nor extra work for extra credit**. So please make all your effort to attend the scheduled tests. Your final grade is not subject to negotiation. After all the lectures, **please do not ask me for extra work for extra credit**.

**Examinations:**

Tests will be administered in class according to the attached schedule. Tests may be a mixture of multiple choice and true/false. Class tests and the common final will test both your understanding of concepts and problem solving ability and will also include questions about the use of Excel to solve problems (e.g., related Excel formulas) in this course.

For in-class tests, you will need to bring a basic calculator (with a square root button!) and *one* 8.5"x11" page of notes (two-sided, must be *hand written* by yourself). Smart phone or smart devices (e.g., Apple Watch) are firmly restricted to the test. Students are required to provide their own pencils and scratch paper. All material needed for tests will be covered in class. All students are required to take the tests.

**Individual Student Projects:**
Individual class projects will be discussed in class. These are ***not*** group projects! Projects are to be submitted on paper by each student by the designated date, including data output and formulas. No diskettes will be accepted, as they are easily misplaced and damaged. *Late projects will be penalized at a rate of 5% per calendar day*. In addition, once the deadline has passed, no further feedback will be given. Use the "fit to one page" option to print your output on 8.5x11" sheets. No report covers, please! Students submitting spreadsheets that are not unique will receive ***a zero grade*** for the project! You may discuss projects with your classmates, but the work you turn in ***must be your own***!

**PowerPoint Slides:**
Copies of the PowerPoint slides for this course can be found on the class website (see page one of this syllabus). To minimize note taking, you should print the slides for each class in advance and bring them to class.

**E-mail communication**
Students are to use their NJIT e-mail (ucid@njit.edu) in communicating with the instructor.
It is also convenient to communicate at the Canvas platform.

**Computer Requirement and Access to the Internet**
NJIT requires all students to have access to a computer at their place of residence. Details as to this requirement may be found on the college's website on the page describing NJIT's Undergraduate Student Computer Requirement.

Access to the Internet is required for this course. NJIT provides on campus access to the Internet to all students. Details as how to access the Internet as well as other resources at NJIT may be found in the Student Quick Start Guide.

**Deadlines/Late Work/Make-ups**
Specific policies concerning the acceptance of late work and make-ups are discussed in the sections covering course requirements. In general, work will not be accepted late and make-ups will not be given. Exceptions will be made when

extraordinary circumstances were responsible for work not being completed on time. Students may need to contact the Dean of Students' office and have it determine that the reasons given for not doing the work on time are valid.

## Incompletes

Incompletes will be given only to students who cannot finish the course on time due to major reasons outside of their control (e.g. illness, family tragedy, military service). Students may need to contact the Dean of Students' office and have it determine that the reasons given for not doing the work on time are valid.

### Students with disabilities

Educational access is the provision of classroom accommodations, auxiliary aids and services to ensure equal educational opportunities for all students regardless of their disability. If you are in need of accommodations due to a disability, please contact Scott Janz (oars@njit.edu), Associate Director of the Office of Accessibility Resources & Services (OARS), Kupfrian Hall 201, to discuss your specific needs. A Letter of Accommodation Eligibility from the OARS authorizing your accommodations will be required. Accommodations need to be requested in advance and will not be granted retroactively.

### Honor Code & Academic Integrity:

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: NJIT Academic Integrity Code.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.

If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

### Common Issues amid the Pandemic

Amid the pandemic, we shall comply with the NJIT guidance and Pandemic Recovery Plan in responding to the COVID19. Individual health and wellness are common concern.
https://www.njit.edu/pandemicrecovery/social-distancing-and-masks
Here are some basic issues and solutions.

If the COVID question is medically related (e.g., I got exposed to COVID yesterday and I am not sure if I should be attending class), students should be directed to Deneen Scuderi (Director, Campus Health Services).
If the question is related to request for excused absences due to any COVID-related issue, or request for submitting assignments late, etc. instructors should be directing student to the Office of the Dean of Students (DOS). DOS will be notifying instructors about students that should be accommodated because of a COVID-related issue

# Tentative Lecture Schedule

Deviations may be necessary
Some supplementary homework assignments will be added as the course progresses.

| Week | Topic | Detailed Outline | Notes | Slides | Assignments |
|---|---|---|---|---|---|
| **Introduction to Business Research Process** | | | | | |
| Week 1 | Introduction Excel Spreadsheet | Self-learning Excel Tutorial | Course Syllabus Posted at Course Website | 1 | Sep. 3rd, First Day of Classes |
| | Overview of Business Research Process | Systematically understand the process for business research, from beginning to the end | Lecture of Introducti on | 1 | Sep. 9th, last day to free Add/Drop |
| **Module 1: General Modeling Fundamentals** | | | | | |
| Week 2 | Overview of Modeling for Decision Making | Course introduction and overview;<br>The nature of modeling for decision-making;<br>Implementation issues.<br>Discuss Excel Competency Exercise | | 1-a,<br>1-b | Excel Competency Exercise due |
| | Business Modeling Spreadsheet Techniques | Effective use of spreadsheets for modeling;<br>Sensitivity/what-if analysis;<br>Review of key Excel functions;<br>Financial Models; Influence diagrams Breakeven and crossover analysis | | 1-c,<br>1-d | HW#1 Due |
| **Module 2: Business Profit Analysis** | | | | | |
| Week 3 | Break Even and Cross Over | Breakeven and crossover analysis | | 2-a | |
| Week 4 | Optimal Pricing | Profit Optimization<br>Optimal Price<br>Pricing strategy | BE/CO lecture; | 2-b | HW#2 Due |

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|---|---|---|---|---|---|
| **Module 3: Simulation** | | | | | |
| Week 5 | Monte Carlo Simulation: Introduction | Introduction to Simulation; Random numbers; Probability distributions; Machine breakdown problem; Queuing applications | | 3-a | Class Handout |
| Week 6 | Monte Carlo Simulation: Applications | Building a spreadsheet simulation; Inventory applications; | | 3-b | Project #1 (Simulation) Due<br><br>HW#3 Due |
| **Week 6** | **Test 1** | | | | Oct. 22 (Tuesday) No Lecture Due to Conference |
| **Module 4: Optimization and Linear Programming** | | | | | |
| Week 7 | Introduction to Optimization Modeling | Introduction to Optimization; A Two-Variable Model Sensitivity Analysis A Product Mix Model | | 5-a | Last Day to Withdraw: Nov. 11th |
| Week 8 | Linear Programming Models | Advertising Models Static Workforce Scheduling Models Aggregate Planning Models Blending Models Production Process Models Financial Models | | 5-b | HW#5 Due |
| **Module 5: Network Models** | | | | | |
| Week 9<br><br>Week 10 | Network Models | Transportation Models Assignment Models Minimum Cost Network Flow Models Shortest Path Models | | 5-c | HW#6 Due |
| **Module 6: Non-Linear Programming and Business Applications** | | | | | |

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|---|---|---|---|---|---|
| Week 11 | Non-Linear Programming | NLP Introduction<br>Production Application;<br>Constructing an Index Fund;<br>Markowitz Portfolio Model; | | 6 | Project # 2 (Transportation) Due<br><br>Nov. 26 (Tuesday) No Lecture |
| **Week 12** | **Test 2** | | | | Thanksgiving Recess (Nov. 28th-Dec.1st) |
| **Module 7: Advanced Business Applications of Non-Linear Programming** | | | | | |
| Week 13 | Advanced Applications of Non-Linear Programming | Blending of the Pooling Problem;<br>Forecasting Adoption of a New Product | | 7 | Project # 3 (iPhone Market Research) Due |
| Week 14 | Comprehensive Final Wrap Up | Project Presentation (if needed) | | | Grade Due Dec. 23rd |