INTRODUCTION TO BUSINESS ANALYTICS WITH EXCEL

COURSE SYLLABUS

Spring 2020

Class Hours  Tuesday and Friday, 11:00 a.m. - 12:20 p.m.

Location  Lemberg 054

Office  Lemberg 246

Office Hours  Schedule with calendly.com/philippewells. Regular scheduling options available Tuesdays, 2:20 - 4:40 p.m. Please email me if you need to schedule at a different time.

TA  Rita Ta, tyc0508@brandeis.edu

Philippe Wells  
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BUS 51a Business Data Analytics with Excel

Course description and learning outcomes
This course is the introductory quantitative methods class for the business major. The objective of the course is to teach students how to analyze data, how to create data visualizations, and how to use data for basic inference. The course is taught using Microsoft Excel, thus allowing students to also learn the most common piece of software used in the workplace to analyze business data.

There are six primary learning outcomes for students:

(1) You will learn the basics of statistics, probability, and data inference.
(2) You will obtain Excel skills at a level that is necessary for any entry level position in business.
(3) You will learn to analyze datasets using Excel tools.
(4) You will learn the basics of data visualization. i.e., you will learn to present data and data analysis in intuitive and meaningful ways.
(5) You will learn the basics of Tableau for data visualizations.
(6) You will learn the basics of regression analysis.

Materials
The textbook for this class is Business Analytics (BA), Cengage, 3rd Edition. The course syllabus refers to the chapters in BA, and the lectures cover the material as it is presented in the textbook. All individual problem sets are based on the problems in the textbook. For the second part of the course, you will purchase two Harvard Business Publishing (HBP) case studies. After the start of the semester, I will share the link to purchase your HBP case studies. You will also receive an email link (from Tableau) to sign up for your Tableau license.

Teaching Methods
The lectures in this course assume that you have already gained exposure to the material through the textbook. Excel is best learned by doing. I will make frequent use of in class examples and in class exercises to convey the material. The individual assignments are designed to provide extensive hands-on experience with Excel. The presentations will require significant Excel data preparation and manipulation similar to the types of analyses required in a business environment. The presentations themselves will allow you to become more comfortable with ways of communicating your data insights, and will help you determine how to most effectively share an analytical story.

Who should be taking this course?
This is a required course for all business majors at Brandeis University. Even if this course can be exempted by taking similar courses in other departments in the University, we strongly recommend that students with an interest in business take this course as it will teach the Excel skills required in the workplace.
**Expected workload**
Students should expect to invest 9 hours per week outside of class on the course. This course relies heavily on the preparatory work that students do on their own with the textbook.

**Grading**
The overall composition of the final grade is as follows:

- Class Participation 15%
- Assignments 30%
- Midterm 20%
- Capstone Project 25%

**Class Participation (15%)**
Thinking through problems and being able to work on them in real time is an important aspect of data analysis in a business environment. Even when it comes to Excel, there is not always one correct answer. Often, there are several ways to solve a problem. By participating in class discussion you will familiarize yourself with different analytical approaches, and you will learn to solve problems on your own as well as part of a team.

**Note:** You are permitted two absences for any reason (e.g., illness, family celebration, job interview, varsity sports, unfavorable airline schedule, you forgot to set your alarm); for each additional absence, your letter participation grade will be reduced by one grading notch, e.g., A- becomes A-/B+, and so on. If you have perfect attendance but rarely participate in class, your participation grade will be C.

**Individual Assignments (30%)**
There are three assignments (one in-class assignment and two take-home problem sets), are all open book, and are to be done individually (without assistance from anyone). The in-class assignment is a 35 minute exercise, and will be given on:
- **Tues, 2/11** (10%)

The take-home problem sets will be posted to LATTE on:
- **Tues 1/28** Due **Tues, 2/4** (10%)
- **Fri, 3/27** Due **Fri, 4/3** (10%)

Assignments are to be submitted electronically, to your TA, by the start of class on the due date. Late assignments will result in a grade deduction.

**Midterm Exam (20%)**
This is a written open-book exam that will take place during normal class hours, on **Tues, 3/10**. You will be asked questions about the materials covered in class and the textbook chapters assigned through 3/3.
Regression Analysis Presentation (10%)
Given in teams of 5 - 6 students on Fri, 3/20. Teams will be assigned during class on Tues, 3/10.
Each presentation should last 8-10 minutes, plus time for a brief Q&A. Please inform me by email by 8 p.m. on Thurs, 2/6, what your proposed topic will be. I will let you know the following day if that topic overlaps too much with another team’s. Each team must email me their presentation deck by 11:00 am, Fri, 3/20.

Develop a hypothesis about a real world relationship that you can test empirically: e.g. is Tesla’s stock price driven by the number of model 3 deliveries (you would probably also want to include other factors if you were looking at this)? Is cell phone data usage in gigabytes driven by average data contract prices? Think of a real world phenomenon that interests you. Then develop a simple model and collect some data to test it. In addition to data websites managed by governments and intergovernmental organizations, places like Statista are a good place to look for data. The presentation must:

- Introduce the phenomenon or problem you are looking at.
  - 1 - 2 slides.
- Display the raw data. Use data visualization tools to convey what you see in the data.
  - 1 - 2 slides.
- Explain the relationship you expect to find, both in words, as well as with a simple regression equation.
  - 1 slide.
- Present your results, and discuss their relevance and implications.
  - 1 - 2 slides.

Capstone Project (25%)
The Capstone project is an opportunity to present an in-depth financial and fundamental analysis of a business sector of your choice. To be completed in teams of 3 - 4 students. Please inform me by email by 11 a.m. on Tues, 3/17, who is on your team, what your team name is, and what your proposed industry and companies will be. I will let you know the following day if those companies have already been selected by another team. Every team must email me their PPT deck by 11:00 a.m., Fri, 4/24.

You have decided to utilize your Excel skills by starting a business analytics consulting firm. You want to carve out your own niche as you get your firm up and running, and have therefore chosen to focus on one particular business sector. In order to market your new firm, you decide to organize and host a business sector conference where you can present your skills. You will give an analytical and data driven overview of trends in the sector. You have separately invited customer and product experts to talk about those aspects of the industry so your presentation can focus on data, financials, and analytics. The presentation must:

- Feature a business sector that has at least three publicly traded companies.
You may first want to choose a company that interests you, and then make sure there are at least two other companies in the same sector.

- Websites like craft.co and owler.com are helpful tools to identify competitors for a particular company.

- Introduction: 1 slide.

- Use Excel to display quarterly data and trends for sales and profits (net income and EBITDA) for the three companies.
  - Include the last 16 quarters of publicly available quarterly data from CapIQ is a good data source.
  - Talk about the general trends in the sector. Note and explain any deviations from these patterns.
  - 1 - 2 slides.

- Identify and compile two data sets (data other than company financial data) that you think help explain trends in the industry.
  - If you were looking at airline travel, you could analyze data sets such as: cost index of flight fuel, average price per mile travelled, infrastructure investments in airports, etc.
  - Develop and test a regression model to help explain industry trends.
    - You might need to collect some more data on total industry revenues and/or profits over time.
    - I am looking for a strong and thoughtful analytical approach. It is always a good thing if your model has strong statistical significance, but in this case, it is more important that your model demonstrates a solid understanding of industry drivers and dynamics.
    - In addition to fundamental drivers, consider other variables to include, such as trend variables or dummies for seasonality (if you have a seasonal time series).
  - 3 - 4 slides.

- Of the three companies you are analyzing, choose one for a more in-depth treatment.
  - Develop a predictive model.
  - Use scenario manager to develop three different scenarios for the next quarterly income statement and cash flow results.
    - Explain the assumptions underlying you scenarios. Try to come up with scenarios that are rooted in real challenges and opportunities facing the company.
  - 2 - 3 slides.

- Summarize your analysis and lay out the implications for management and the industry.
  - 1 - 2 slides.
  - 1 slide for sources and references.
  - If necessary, include more detailed analyses or models in a data appendix.
Style of presentation. Put your model, charts, and thoughts together in a PowerPoint presentation. As a group (make sure each team member speaks), present your insights to the class. The objective of your financial and fundamentals analysis is to gain a deeper understanding of the business, the companies, the history, and the potential future evolution of the sector.

Goal and conclusions. Your conclusions are meant to provide useful information for company management. Your insights can be used for business strategy recommendations, but at this stage, you are focusing on the analytical portion of the work. Your presentation is intended to give a sense of (1) how the companies are performing, (2) how the fundamental drivers of the industry have evolved, (3) how regression analysis can help, (4) what this implies for the next quarter for your selected company, and (5) what the broader outlook is for the next few years.

The Powerpoint deck is due by **11:00 a.m., Fri, 4/24**.

Notes
- Grades on team projects are assigned to all members of the team, though I reserve the right to alter individual grades if it is clear that an individual did not contribute to the assignment in a consistent and meaningful way.

- **Sending emails to me on team deliverables:** To avoid deductions, always “cc” all of your team members on emails (using everyone’s @brandeis.edu email address) - and only send me one email per team for each deliverable. In the subject line of the email, note your team name, followed by the deliverable (e.g. Team Blue, Final PPT or Team Blue, Proposed Company).

Disabilities
If you are a student with a documented disability on record at Brandeis University and wish to have a reasonable accommodation made for you in this class, please see me immediately before or after the first class.

Academic Integrity
You are expected to be honest in all of your academic work. Please consult Brandeis University Rights and Responsibilities for all policies and procedures related to academic integrity. Students may be required to submit work to TurnItIn.com software to verify originality. Allegations of alleged academic dishonesty will be forwarded to the Director of Academic Integrity. Sanctions for academic dishonesty can include failing grades and/or suspension from the university. Citation and research assistance can be found at LTS - Library guides.

Submissions
All work must be submitted before the required date and time. Only with my prior approval will late work be allowed, and that is only in exceptional circumstances.
Absences
The class discussions are not limited to what is in the textbook. Therefore, if you are absent, it is your responsibility to ask a peer for their class notes and read the textbook to catch up. You are permitted up to two absences for any reason; for each additional absence, your grade will be reduced.

Teamwork
You will be assigned to teams and each team member is expected to contribute equally to all team assignments. If this does not occur, it will impact that team member’s grade.

Midterm
You will have one midterm exam which covers Sessions 1 - 13. No make-up exams will be permitted.

Technology
Bring laptops to every class. Please put away all other electronic devices (and keep on silent mode) for the duration of class.

Course Outline

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<tr>
<th>Class</th>
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<th>Topic</th>
<th>Assignments</th>
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| 1     | Tues, 1/14| Describing and Visualizing Data | - BA: Chapter 1  
For instructions, see pp. 11-12 of this syllabus |
| 2     | Fri, 1/17 | Excel Basics                 | - BA: Chapter 2  
- Familiarize yourself with Excel Basics using Lynda online through the Brandeis Library website: Excel 2016 Essential Training: Chapters 1-5. |
| 3     | Tues, 1/21| Data Visualization           | - BA: Chapter 2  
- Lynda Excel 2016 Essential Training: Chapter 7 (Charts) and Chapter 14 (Pivot Tables). |
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<th>Class</th>
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<td>Fri, 1/24</td>
<td>Data Visualization (cont’d)</td>
<td>- BA: Chapter 3</td>
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<td>● Pivot Tables</td>
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<td>● Pivot Charts</td>
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<td>● Data Cleansing</td>
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<td>5</td>
<td>Tues, 1/28</td>
<td>Modeling in Excel</td>
<td>- BA: Chapter 10</td>
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<td>● Models for Decision Making</td>
<td>- Individual problem set 1 (10%) assigned. To</td>
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<td>● Drivers</td>
<td>be submitted electronically, to your TA, by 11:00</td>
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<td>● Demand Models</td>
<td>a.m. Fri, 1/31.</td>
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<td>● Profitability Models</td>
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<td>● Auditing and Errors</td>
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<td>Fri, 1/31</td>
<td>Company Financial Models</td>
<td>- BA: Chapter 10</td>
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<td>● Business Drivers and Assumptions</td>
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<td>● Financial Reports</td>
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<td>● 10Ks, 10Qs</td>
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<td>● Projection Models for Income and Cash Flow</td>
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<td>7</td>
<td>Tues, 2/4</td>
<td>Financial databases for business research</td>
<td>- BA: Chapter 5</td>
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<td>Probability</td>
<td>- Guest Lecturer: Jason Bernard</td>
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<td>● Modeling Uncertainty</td>
<td>Associate Director of Academic Technology, IBS</td>
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<td>● Probability Rules</td>
<td>- Individual Problem 1 set due. Submit</td>
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<td>● Venn Diagrams</td>
<td>electronically to your TA by 11:00 a.m.</td>
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<td>● Conditional Probability</td>
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<td>● Bayes’ Theorem</td>
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<td>Fri, 2/7</td>
<td>Random Variables</td>
<td>- BA: Chapter 5</td>
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<td>● Discrete Distributions:</td>
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<td>Bernoulli, Binomial, Poisson</td>
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<td>● Continuous Distributions:</td>
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<td>Uniform, Normal, Exponential</td>
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<td>9</td>
<td>Tues, 2/11</td>
<td>Statistical Inference</td>
<td>- BA: Chapter 6</td>
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<td>● Sampling Distributions for Means and Proportions</td>
<td>- In-class graded exercise (35 min; 10%).</td>
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<td>Fri, 2/14</td>
<td>Statistical Inference</td>
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<td>- Central Limit Theorem</td>
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<td>- Point &amp; Interval Estimation</td>
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<td>Tues, 2/18</td>
<td>Midterm Recess</td>
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<td>Fri, 2/21</td>
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<td>11</td>
<td>Tues, 2/25</td>
<td>Hypothesis Testing</td>
<td>- BA: Chapter 6</td>
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<td>- Test for Population Mean</td>
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<td>- Test for Population Proportion</td>
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<td>- Big Data and Hypothesis Testing</td>
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<td>- Difference in Means</td>
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<td>12</td>
<td>Fri, 2/28</td>
<td>Linear Regression</td>
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<td>- Least Squares Method</td>
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<td>- Degrees of Freedom</td>
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<td>- Conditions for Linear Regression</td>
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<td>13</td>
<td>Tues, 3/3</td>
<td>Midterm Review</td>
<td>Exams will cover everything we have done to date. The exam is open book, so bring all course materials and notes, as well as a laptop.</td>
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<td>14</td>
<td>Fri, 3/6</td>
<td>Midterm</td>
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<td>15</td>
<td>Tues, 3/10</td>
<td>Regression Analysis</td>
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<td>- Logistic Regression</td>
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<td>- Categorical Independent Variables</td>
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<td>- Data Preparation and Partitioning</td>
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<td>16</td>
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<td>Time Series and Forecasting</td>
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<td>- Exponential Smoothing</td>
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| 17    | Tues, 3/17| Multivariate Regression Analysis                | - **BA**: Chapter 7, 10  
- What-If Analysis  
  - Data Tables  
  - Goal Seek  
  - Scenario Manager |
|       |           | What-If Analysis                                | - **BA**: Chapter 7, 10  
- What-If Analysis  
  - Data Tables  
  - Goal Seek  
  - Scenario Manager |
|       |           | - Email me your proposed teams and Capstone Project topics by 11 a.m. on Tues, 3/17. PPT decks due by 11:00 a.m., Fri, 4/24. |
| 18    | Fri, 3/20 | Regression Analysis Presentations               | Team Presentations. PPT decks to be submitted to me electronically by 11:00 a.m. |
| 19    | Tues, 3/24| Monte Carlo Simulation                          | - **BA**: Chapter 11  
- Risk Analysis  
- Simulation Modeling |
|       |           | - Introduction to Tableau  
- Pivot tables and Tableau  
- Basic tables |
|       |           | - Individual **problem set 2 (10%) assigned**. To be submitted electronically, to your TA, by 11:00 a.m., Fri, 4/3. |
| 20    | Fri, 3/27 | Advanced Data Visualization                    | - Graphs  
- Maps  
- Creating a Dashboard on Tableau  
- Creating a Storyboard on Tableau |
|       |           | - Individual **problem set 2 due**. Submit electronically to your TA by 11:00 a.m. |
| 21    | Tues, 3/31| Advanced Data Visualization                    | - R, R Studio, GIS  
- **Individual problem set 2 due**. Submit electronically to your TA by 11:00 a.m. |
| 22    | Fri, 4/3  | Connection to Other Software                   | - R, R Studio, GIS  
- **Individual problem set 2 due**. Submit electronically to your TA by 11:00 a.m. |
|       |           |                                                 | **Brandeis Thursday**  
**Passover and Spring Recess**  
**Tues, 4/7**  
**Fri, 4/10**  
**Tues, 4/14**  
**Fri, 4/17**  
**Tues, 4/21** |
| 23    | Fri, 4/17 | Connection to Other Software                   | - R, R Studio, GIS  
- **Individual problem set 2 due**. Submit electronically to your TA by 11:00 a.m. |
| 24    | Tues, 4/21| Linear Optimization and Decision Analysis       | - **BA**: Chapter 12, 15  
- Linear Optimization  
- Pay-off Analysis  
- Decision Trees |
|       |           |                                                 | **Brandeis Thursday**  
**Passover and Spring Recess**  
**Tues, 4/7**  
**Fri, 4/10**  
**Tues, 4/14**  
**Fri, 4/17**  
**Tues, 4/21** |
For our first class, on 1/14, please look at the following sources of data:

**US census data visualization site:**
[https://www.census.gov/dataviz/](https://www.census.gov/dataviz/)

Look at the Data Visualization Gallery page for 2 minutes, scrolling down the various thumbnails. Write down your immediate reactions. Now, explore the “Where do college graduates work?” Data Visualization. Hover over different parts of the graph. What strikes you as interesting?

**Data.gov:**
[https://www.data.gov/](https://www.data.gov/)

Data.gov is a federal open government data access site. It is the new-ish (established in 2009) face of federal government data. Look for information on the movie industry. **This will take a few clicks.** The movie industry represents a small share of the economy, so we will need to drill down quite a bit. Search for “2012 economic census” in the landing page search box of data.gov. When you are on the results page, click the second link from the top, “Economic Census”. After you are taken to the next page, click “visit page”. Then, under Data Tables, click “View All Data Tables”. Then click on “2012 Information (NAICS Sector 51)”. Now, scroll down to “Core Series”, and click on the first link (Core Business Statistics Series: Comparative Statistics for the US and the States). You should now be looking at the data. Check out the download link, and download the data as a .csv file. You don’t need to open the file. Did the download work? Now go back to your browser and scroll to the line that says: “Motion picture and video industries.” What were sales in 2012? How did that compare to sales in 2007? Scroll around for two more minutes. What else do you notice?

**MPAA (Motion Picture Association of America):**
[https://www.mpaa.org/research-policy/](https://www.mpaa.org/research-policy/)

The federal government focuses on collecting data for a wide range of industries. For more detailed information about an individual industry, in this case, the movie industry, we have to look elsewhere. Often, the industry trade group will collect data on an annual basis.
Scroll down the research and policy page, click on “Research Reports”, and click on the 2018 THEME report link. When it takes you to the page, click the button “View/Download”

Spend 5 minutes scrolling through the report.

- What can you say about subscription video subscriber numbers compared to cable subscriber numbers?
- What do you notice about the mix of US Home Entertainment Consumer Spending on digital vs physical?
  - What is the overall trend in spending (digital and physical combined)?

There’s nothing to hand in; just bring your written comments to class and we will discuss them.