

**BUSINESS ANALYTICS AND DATA VISUALIZATION**

# General Course Information:

Professor: Dr. Andres Fortino

E-mail: [agf249@nyu.edu](mailto:agf249@nyu.edu)

Business Analytics and Data Visualization MASY-GC5000-200

3 credits

Fall 2019

Room: 529 Midtown Center Office hours: By appointment

Course schedule: Wed 2:00 PM – 4:35 PM

Jan 29 – May 6, 2019, no class Mar 18

# Course Description:

This course prepares students to turn business data into actionable information and communicate insights through visualizations. Students learn software systems that enable marketers to integrate and transform data, analyze the data, and visualize the results and insights. Students learn how to use these systems and related technology in the context of managing CRM for sales, marketing, and customer relationships. Students use analytical and data visualization software, to clean, manage and prepare data for analysis, and analyze real-world data sets to develop strategic recommendations for managerial actions. They apply techniques to convert data to information, explore datasets, analyze, summarize, and visualize data, creating interactive exploratory analytics and preliminary predictive analytics to develop actionable insights.

# Course Prerequisites:

None.

**Course Structure/Method:**

This is an in-person lecture and lab class. You derive the greatest benefit from the class by being present in class every week, following the instructions of your faculty on the processes, procedures and methods of business analytics. Then practicing them during class session or the lab session under faculty direction to master them. You get further opportunities to master the concepts by doing all the homework assignments. This is an individual-efforts class, no teamwork. You are welcomed to consult with colleagues on deliverables but you will derive the greatest return on your investment of time and tuition if you always do your own work. That is the way to transform into a professional in this field. And the efforts you put in to master the material will pay great dividends when you interview for a job and begin working in the field. This is your opportunity to become a professional. Your faculty member is always available to consult when you have problems and can’t complete an assignment because you did not understand something.

# Course Learning Outcomes:

Students who successfully complete the course requirements should be able to:

* Prepare data that will be used in forecasting sales and marketing outcomes
* Analyze information to discover and explore meaningful relationships in datasets
* Develop strategic recommendations based on interpretation of real world datasets
* Produce analytically-supported data visualizations to communicate sales and marketing opportunities

# Communication Policy:

Please always send any email communication to my faculty NYU email address ([agf249@nyu.edu](mailto:agf249@nyu.edu)). It is always best to communicate through NYU Classes course-mail as that leaves an official record of all our communication which protects you. All NYU students taking classes for credit must use their NYU email to communicate with faculty at all times. The use of NYU Classes course-mail supports your student privacy and FERPA rights. If you follow this process all inquiries will be answered within 24 hours.

# Course Expectations:

To be considered as turned in on time assignments should be posted electronically to appropriate assignment link in NYU Classes before the class starts. Any late assignments will be penalized a whole letter grade for lateness. No late assignments will be accepted after 7 days from their due dates. After seven days the assignment will not be accepted and receive a failing grade. The only exception is the final assignment which will not be accepted at all past the posted due date. Assignments must be posted to the student’s account in the appropriate place in the class website. Assignments emailed to the instructor will not be considered as having been turned in. Do not wait to the last minute to post an assignment and then find you can’t post it due to the website or the network unavailability. Plan appropriately to hand assignments in on time.

Students are expected to attend all classes. Excused absences are granted in cases of documented serious illness, family emergency, religious observance, or civic obligation.

Unexcused absences from sessions may have a negative impact on a student’s final grade. Students are responsible for assignments given during any absence.

Each unexcused absence will result in a student’s final grade being lowered by 5%. A student who has *three* unexcused absences will earn a *Fail* grade.

For an absence to be excused by serious illness, you must provide documentation in the form of a doctor's or hospital note. You should submit this documentation to myself as well as your academic advisor.

In the case of religious observance or civic obligation, this should be reported in advance. Students should arrive in class and be in their seats on or before class start time of 12 AM.

Students arriving after 12 PM will be considered late. Two late arrivals will be counted as one absence. Students arriving in class after 12:45 PM will be considered absent.

University Calendar Policy on Religious Holidays: [https://www.nyu.edu/about/policies-guidelines-](https://www.nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/university-calendar-policy-on-religious-holidays.html) [compliance/policies-and-guidelines/university-calendar-policy-on-religious-holidays.html](https://www.nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/university-calendar-policy-on-religious-holidays.html)

# Required and Recommended Material:

**Required course texts:**

1. Klimberg, R., McCullough, B. D, & SAS Institute. (2016). *Fundamentals of predictive analytics with JMP( 2nd edition.), Ron Klimberg and B. D. McCullough.* Cary, NC. SAS Institute. [KM]

# Recommended additional text:

1. Carver, R. (2014). *Practical Data Analysis with JMP( 2nd edition.)*. Cary, NC. SAS Institute. [RC]
2. Shron, M. (2014). *Thinking with Data* (1st edition.). O’Reilly Media (electronic version may be obtained at NYU Library). [S]
3. Gibson, Lawrence D. *Not Just Numbers: Rediscovering the Promise and Power of Marketing Research*. Maven House, 2016. Read it online: <http://bit.ly/2vqf51L>
4. Dunning, Ted, and Ellen Friedman. "Practical Machine Learning: Innovations in Recommendation." O’Reilly (2014). [O]

# Software:

1. **REQUIRED - JMP 14** (statistical discovery software by SAS): The most economical way to get access to this software is through a 6-month or 12-month rental through this website: <http://onthehub.com/jmp/>

Or you can access it free from the NYU Virtual Computer Lab.

# Data sets:

1. Data from the K&M book can be downloaded from:<http://support.sas.com/publishing/bbu/zip/64395.zip>
2. Other data sets for class exercises and assignments will be available through the class website

**Assessment Strategy:**

1. **Assignments** – Module Assignments – 3 Assignments (600 points, 60%)

Each of the major modules of the class will be concluded with an assignment in the form of an exercise to assure the student have mastered the material presented. Instructions for the assignments are posted to the class website. Each assignment is worth 200 points towards the final grade. Late assignments will receive a 20% penalty in the grade. Assignments submitted more than one week late will receive no credit.

* Assignment 1 – Case Study 1 (Individual) - Web Analytics (150 pts, 15%)
* Assignment 2 – Kaggle Competition Titanic Disaster (Individual) - (150 pts, 15%)
* Assignment 3 – Case Study 2 (Team) - Call Center Performance (200pts, 20%)

1. **Labs** – There will be a lab during most weekly meetings. 5 graded Labs (250 points, 25%) The labs will take place during the last hour of each weekly meeting. The answers to the labs will be entered in the appropriate Quiz in the NYU Classes class website. If the lab is not completed within the hour, each student will have and additional 24 hours from the end of the lab to complete the lab work and enter a complete set of answers to the labs. Lab 7 (optional) score can substitute for the lowest score of any of the other labs.
   * Lab 1 - Data Wrangling (50 pts)
   * Lab 2 - Framing Analytical Questions (50 pts)
   * Lab 3 - Descriptive Statistics (50 pts)
   * Lab 4 - Linear Regression (50 pts)
   * Lab 5 - Predictive Models (50 pts)
   * Lab 6 - Data Visualization (50 pts)
   * Lab 12 – Design of Experiments (optional) (50 points)
   * Lab 7 - Practice Final Exam (optional) (50 pts)
2. **Final** – There will be a short 1 hour in-class final. (100 points, 10%). A practice final exam will be made available for you to practice taking the final exam Lab 7.
3. **Review Quizzes and RAIKS** (100 points, 10%)**:**

There are12 required REs (Reflection Exercises, 5 points each for taking them, not based on the score). To assist you to master the course materials we are providing 12 Review Quizzes (RQs, one per week). They are 10 questions surveys of what and how you learned that week and the week before. They are to be taken during the week following each session (they are open until midnight of the next session). This is not an exercise to measure what you know but to assist you transfer knowledge from short term memory to long term memory. **In the past students who used these exercises got as much as a 30% increase in their final exam grade.** The quizzes are open online for a whole week and they are timed to maximize knowledge transfer. So be sure to take each quiz when it is available. (60 points)

There are also two required Rapid Assessment of Individual Knowledge and Skills assessments (RAIKS) 20 points each. **The scores do not count, but they will assure you that you are prepared to start the class (you have the prerequisites) and that you have mastered the concepts of the class.**

# NYU School of Professional Studies Graduate Grading Scale

Grading for graduate programs is by letter grade: A, A-, B+, B, B-, C+, C, C-, and F. For NYUSPS’s complete graduate grading policies, including criteria for a grade of incomplete, taking a course on a pass/fail basis, and withdrawing from a course, see:

<https://www.sps.nyu.edu/homepage/student-experience/policies-and-procedures.html#Graduate1>

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Letter** | **%** | **GPA** | **Descriptions** | **Definitions** |
| A | 95-100 | 4.0 | Exceptional | Demonstrates exceptional mastery of all learning outcomes of the course and thorough and complete understanding of all concepts. |
| A- | 90-94 | 3.7 | Excellent | Demonstrates highly competent mastery of all learning outcomes of the course and strong understanding of all concepts. |
| B+ | 87-89 | 3.3 | Very Good; exceeds course standards | Demonstrates mastery of all learning outcomes of the course and understanding of core concepts. |
| B | 83-86 | 3.0 | Good; meets course standards | Demonstrates mastery of some learning outcomes; understanding of some core concepts could be improved. |
| B- | 80-82 | 2.7 | Somewhat Satisfactory; meets some course standards and requires improvement | Demonstrates basic understanding of some learning outcomes; improved understanding of all core concepts is needed. |
| C+ | 77-79 | 2.3 | Less than Satisfactory; requires significant improvement | Demonstrates partial understanding of all learning outcomes and core concepts; requires significant improvement. |
| C | 73-76 | 2.0 | Unsatisfactory; requires substantial improvement | Demonstrates partial understanding of some learning outcomes and core concepts; requires substantial improvement. |
| C- | 70-72 | 1.7 | Unsatisfactory; requires extensive improvement | Demonstrates poor understanding of all learning outcomes and core concepts; requires extensive improvement. |
| F | Below 70 | 0.0 | Fail | Demonstrates minimal to no understanding of all key learning outcomes and core concepts; work is unworthy of course credit towards the degree. |

# Academic Integrity:

Students are expected to quote accurately and identify the origin of citations from others, as well as to acknowledge when ideas are dependent upon concepts developed from other sources. This process of attribution and referencing allows each individual to demonstrate how her or his understanding and ideas relate to an existing body of knowledge—and add to it. Proper attribution demonstrates the values of academic integrity, and systematic reflection and intellectual development. To do otherwise and not reveal sources constitutes plagiarism. Plagiarism is a form of academic dishonesty.

For the full SCPS Policies on Academic Integrity and the Academic Integrity Disciplinary Procedures, go to: [http://www.scps.nyu.edu/academic-policies-and-](http://www.scps.nyu.edu/academic-policies-and-procedures.html#NYU_SCPS_Policy_on_Academic_Integrity_and_Plagiarism) [procedures.html#NYU\_SCPS\_Policy\_on\_Academic\_Integrity\_and\_Plagiarism](http://www.scps.nyu.edu/academic-policies-and-procedures.html#NYU_SCPS_Policy_on_Academic_Integrity_and_Plagiarism)

# NYUSPS Policies:

NYUSPS policies regarding the Family Educational Rights and Privacy Act (FERPA), Academic Integrity and Plagiarism, Students with Disabilities Statement, and Standards of Classroom Behavior among others can be found on the NYU Classes Academic Policies tab for all course sites as well as on the University and NYUSPS websites. Every student is responsible for reading, understanding, and complying with all of these policies.” We will be using Turnitin on the proposal, final report and midterm exam. Please check your work before submitting to make sure that it is at least 90% your work.

The full list of policies can be found at the web links below:

* University: <http://www.nyu.edu/about/policies-guidelines-compliance.html>
* NYUSPS: [http://sps.nyu.edu/academics/academic-policies-and- procedures.html](http://sps.nyu.edu/academics/academic-policies-and-procedures.html)

# NYU Classes:

To learn more about NYU Classes, visit the [Training and Support website](https://wikis.nyu.edu/display/nyuclasses/), or browse the NYU ServiceLink website for support articles relating to [NYU Classes.](http://www.nyu.edu/servicelink/service/NYU%2BClasses) For technical support, contact the [IT Service Desk](http://www.nyu.edu/its/askits/helpdesk) (available 24/7/365) at 212-998-3333 or [AskITS@nyu.edu](mailto:AskITS@nyu.edu).

School Grading Policies:

**NYUSPS Graduate** [http://sps.nyu.edu/academics/academic-policies-and-](http://sps.nyu.edu/academics/academic-policies-and-procedures/graduate-academic-policies-and-procedures.html#Grades) [procedures/graduate-academic-policies-and-procedures.html#Grades](http://sps.nyu.edu/academics/academic-policies-and-procedures/graduate-academic-policies-and-procedures.html#Grades)

# Class Schedule

Session 1, Jan 29, Week 1 Introduction Module 1: What is Data Analytics?

Initial RAIKS due, Form teams of four for Case 2 the team case

Reading: [KM] 1, [RC] 1

Session 2, Feb 5, Week 2

Module 2: Data Wrangling - data scraping and data cleansing

Lab 1: Data wrangling

Review Quiz due

Reading: [RC] 1

Session 3, Feb 12, Week 3

Module 3 Data Analytics

The CoNVO Model and Framing Questions

Review Quiz due

Lab 2: Framing Questions

Reading: [RC] 3

Session 4, Feb 19, Week 4

Begin Module 4: Descriptive Analytics

Introduction to JMP

Review Quiz due

Reading: [S] 1-4

Session 5, Feb 26, Week 5

Module 5: Descriptive Analytics

Contingency Tables and Chi-Squared

Lab 3: Descriptive Stats, Chicago Crime

Review Quiz due

Reading: [KM] 3, 4, [RC] 3-5

Session 6, Mar 4, Week 6

Module 6: Data Visualization

Data Visualization for Exploration

Review Quiz due

Lab 4: Airline Case Studies

Session 7, Mar 11, Week 7

Module 7: Predictive Analytics A

Predictive Analytics and Linear Regression

Reading: [KM] 4, 5, 6, [RC] 7-8

Review Quiz due

Lab 5: Linear Regression, Old Faithful

**NO CLASSES, Mar 18 Spring Recess**

Session 8, Mar 25, Week 8

Module 8: Predictive Analytics B

Logistical Regression and Time Series

Lab 4: Telecomm Churn

Reading: [RC] 10-12

Review Quiz due

Assignment 1 due – Analytics Case Study

Session 9, Apr 1, Week 9

Module 10: Machine Learning for Business

Data Analysis Analytic Models – Clustering

Review Quiz due

Reading: [KM] 9

Session 10, Apr 8, Week 10

Module 9: Inferential Statistics

Assurance of Results: ANOVA

Reading: [KM] 7, 8, 9, [RC] 16-2

Review Quiz due

Lab 5: Clustering and Decision Trees

Session 11, Apr 15, Week 12

Module 11: Data Visualization

Review Quiz due

Data Visualization for Impact

Session 12, Apr 22, Week 11

Module 12: Design of Experiments

Conjoint Analysis

Assignment 2 (Team) due – Call Center Case Study

Lab 6: Data Visual for Impact (optional)

Review Quiz due

Reading: [RC] 21,

Session 13, Apr 29, Week 13 Module 6

Module 13: Text Analytics

Data Mining – Text Analytics

Review Quiz due

Reading: [O] 1

Session 14, May 6, Week 14

Assignment 3 due: TiVO segmentation Analytics

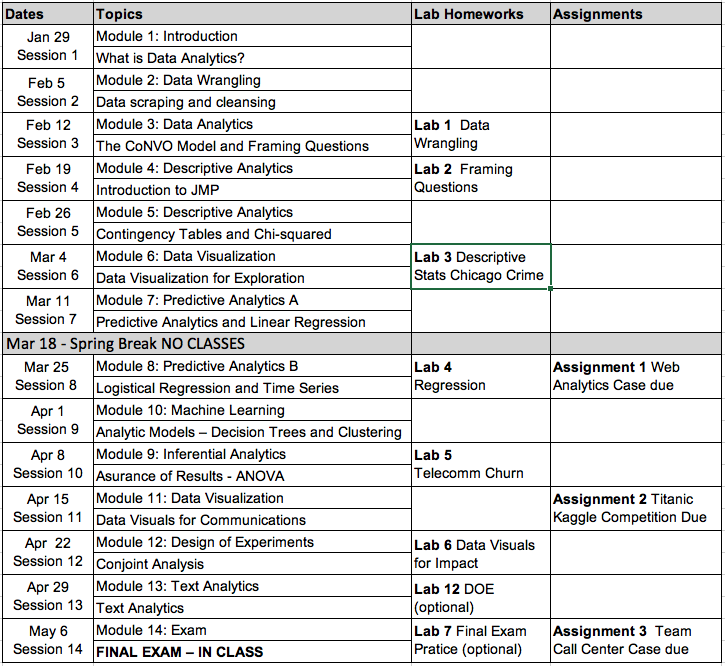
Final RAIKS due

Review Quiz due

Lab 7: Final Exam Practice (optional)

Final Exam **IN CLASS**

# Course Outline:



Revisions

Version 3 – Jan 15 – Added Kaggle competition assignment, removed Tivo assignment, moved due dates for assignments

Version 4 – Jan 27 – Changed late penalty to 20%