

**BUSINESS ANALYTICS AND VISUALIZATION**

**General Course Information:**

Adjunct Instructor: Dr. Andres Fortino, PE

E-mail: agf249@nyu.edu

Special Topics: Business Analytics and Visualization Section MASY-GC5000-102

3 credits

Fall 2018

Room: 529 Midtown Center

Office hours: By appointment

Course schedule: Saturdays 10:00AM – 5:00PM Feb 2– Mar 9, 2019, 6 In-Person Lab Sessions

**Course Description:**

This seminar will enhance curriculum by identification, analysis and application of special topics pertinent to the Management and Systems degree. The specific titles and content of each seminar will change to reflect emerging areas of interest, which can only be determined at the time of offering.  The course may be used to satisfy the elective degree requirement.  Applicability to specific concentrations will be noted in the course schedule and is at the department’s discretion.

**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 with on team deliverable. 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.

This course prepares students to turn business data into actionable information using data analytics tools and techniques including data visualization. We will go beyond descriptive analytics to include regression, decision trees, clustering and other analytic models, with skills-building labs based the SAS JMP program, and Microsoft Excel.

Students will learn software systems for data integration/transformation, analysis and visualization. They will also learn how to use technology in the context of their applications to sales, marketing, and finance, operations, product development.  Students will learn through a hands-on approach. Guided by the instructor and using software and assigned readings/videos, they will prepare and analyze real-world data sets to learn how to develop strategic recommendations for managerial actions. Students who successfully complete the course requirements will be able to manage data, inclusive of data access, data cleansing, and data preparation. They will also be able to apply techniques for converting data to information, including data exploration, summarization, visualization, analyze data, interactive exploratory analytics, and introductory predictive analytics.

**Course Learning Outcomes:**

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

* Manage data, including
  + Data access
  + Data cleansing
  + Data preparation
* Apply techniques for converting data to information, including
  + Data exploration
  + Summarization
  + Visualization
* Analyze data
  + Interactive exploratory analytics, contingency tables
  + Introductory predictive analytics, linear and logistical regression.
  + Inferential tests, hypothesis testing
  + Clustering, decision trees

**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. Non-degree students do not have NYU email addresses. 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 *two* 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 10 AM.

Students arriving after 10 AM will be considered late. Two late arrivals will be counted as one absence. Students arriving in class after 10:30 AM will be considered absent.

University Calendar Policy on Religious Holidays: <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:**

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]

**Required cases:**

Ivey Cases. Purchase Case Course Pack ($13 electronic download). Create an Ivey account at [www.iveycases.com](http://www.iveycases.com/) and click on this link or copy into your browser: <https://www.iveycases.com/CoursepackView.aspx?id=19582>

**Recommended additional texts:**

Carver, R. (2014). *Practical Data Analysis with JMP (2nd edition.)*. Cary, NC. SAS Institute. [RC]

Shron, M. (2014). *Thinking with Data* (1st edition.). O’Reilly Media (electronic version may be obtained at NYU Library). [S]

**Software:**

**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/>

Also accessible at NYU Virtual Computer Labs – see ITU for instructions to access.

Do not get the student version as it is limited and most machine learning algorithms we will be using are not available on it.

**Data sets:**

1. Data from the K&M book can be downloaded from:

<http://support.sas.com/publishing/bbu/zip/64395.zip>

1. Other data sets for class exercises and assignments will be available through the class website

**Assessment Strategy:**

1. **Assignments** – Module Assignments – 3 Assignments (650 points, 65%)

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 10% penalty in the grade. Assignments submitted more than one week late will receive no credit.

* Assignment 1 – Case Study 1 (Individual) - Web Analytics (200 pts)
* Assignment 2 – Case Study 2 (Team) - Call Center Performance (250pts)
* Assignment 3 – Case Study 3 (Individual) - TiVo Segmentation (200 pts)

1. **Labs** – There will be a lab during each weekly meeting. 5 graded Labs (250 points) 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 (not graded)
   * Lab 7 - Practice Final Exam (optional) (50 pts)
2. **Final** – There will be a short 1 hour in-class final. (100 points). A practice final exam will be made available for you to practice taking the final exam Lab 7.

**Reflection Exercises and RAIKS:**

There are13 REs (Reflection Exercise) and three RAIKS (Rapid Assessments of Individual Knowledge and Skills). To assist you to master the course materials we are providing 13 Reflection Exercises (REs, on per week). They are 5 questions surveys of what and how you learned that week. They are to be taken right after each session (they are open until midnight that day). 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.** They are not required but you are highly encouraged to take them. The quizzes are open online for a very short time and they are timed to maximize knowledge transfer. So be sure to take each quiz when it is available.

There are also three Rapid Assessment of Individual Knowledge and Skills assessments (RAIKS). **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.**

To encourage you to take these assessments, there will be a 25 point bonus (2.5% of the final grade) if you complete at least 90% (12 out of the 14 assessments) of them.

**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.”

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>

**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: <http://scps.nyu.edu/academics/academic-policies-and-procedures/graduate-academic-policies-and-procedures.html#Grades>

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| **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. |

**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+Classes). For technical support, contact the [IT Service Desk](http://www.nyu.edu/its/askits/helpdesk) (available 24/7/365) at [212-998-3333](tel:212-998-3333) or [AskITS@nyu.edu](mailto:AskITS@nyu.edu).

**Course Outline:**

Feb 2: Week 1: Data Management and Visualization

Session 1 - Module 1: Introduction, What is Data Analytics?

Session 2 - Module 2: Data Wrangling, Data scraping and cleansing

Lab 1: Data Wrangling

Feb 9 - Week 2: Framing Questions

Session 3 - Module 3: Data Analytics, The CoNVO Model and Framing Questions

Session 4 - Module 4: Descriptive Analytics, Introduction to JMP

Lab 2: Framing Questions

Feb 16 - Week 3: Descriptive Analytic Tools

Session 5 - Module 5: Descriptive Analytics, Contingency Tables and Chi-squared

Session 6 - Module 6: Data Visualization Data Visualization for Exploration

Lab 3: Descriptive Stats, Chicago Crime

Feb 23 - Week 4: Regression Modeling

Session 7 - Module 7: Predictive Analytics A Predictive Analytics and Linear Regression

Session 8 - Module 8: Predictive Analytics B, Logistical Regression and Time Series

Lab 4 - Linear Regression, Old Faithful Eruptions

Assignment 1 - Web Analytics due

Mar 2 - Week 5: Machine Learning for Business Data Analysis

Session 9 - Module 9: Inferential Analytics, Assurance of Results - ANOVA

Session 10 - Module 10: Machine Learning, Analytic Models – Decision Trees and Clustering

Lab 5 - Telecomm Churn

Assignment 2: Call Center Performance due

Mar 9 - Week 6: Data Visualization for Presentation

Session 11 - Module 11: Data Visualization, Data Visuals for Communications

Lab 6: Data Visuals for Impact

Session 12: Module 12: Exam FINAL EXAM – IN CLASS

Assignment 3 - TiVo Segmentation Analytics due

**Course Schedule** 