

**ECO520: Business Analytics Tools II**  
**Autumn, 2019**  
**Tuesday 5:45-9:00, Room Lewis 1309**  
updated: 7/20/2019

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**INSTRUCTOR:** Jin Man Lee

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The best way to reach me is to send email. Please use ECO520 as a prefix on the subject line, and that will get my attention immediately. If you don't receive my reply within 24 hours, please remind me again. Due to many email filters and mass email, your email might be lost.

**OFFICE HOURS:** M/W 3:30 - 4:30 , TUE 3:30-4:30 or by appointment

**COURSE OBJECTIVES**

This course introduces advanced data analytical skills by identifying meaningful patterns of data and transforming patterns into statistical models to make more profitable decisions using big data. It covers descriptive, predictive, and prescriptive analytics. The topics are included on advance levels of clustering analysis, discrete choice, multivariate regression, random forest, and neural network analysis to find the best suitable techniques to drive the best data analytics in business decision. SAS and R will be extensively used to develop the best analytical models using various business data including social media, housing, health, bank financing, and public data such as Census and CPS.

**PREREQUISITE**

Applied Quantitative Analysis or passed the equivalent tests at the graduate school level

**RECOMMENDED TEXTBOOK**

Business Analytics Principles, Concepts, and Applications with SAS What, Why, and How, 2014, ISBN-10: 0-13-398940-2, ISBN-13: 978-0-13-398940-3

More required readings and article will be available on D2L every week

**SOFTWARE USED in CLASS (required for Assignments)**

- SAS for Windows 9.2-9.4 : all DePaul students allowed to install SAS on their own Windows 7 or later machines. All computers at DePaul computer labs have the latest SAS installed.
- R for any platform. Current version: 3.6.0. This is a free public domain statistical program available to install any personal computers.

**EXAMS and PROJECT**

- Midterm Exam (10/22/2019, In-Class Test for 90 Minutes)
- Final Project Presentation (11/19/2019)

- Final Project Due (11/26/2019, Final Project due before 10:00 PM, upload all files to D2L )

**ASSIGNMENTS** Most of Assignments will be focused on computational work using data in class or a data chosen by me.

- All assignments are to be prepared individually unless otherwise stated by me. You risk an academic integrity violation if submit the same work and answers with others. Group study is encouraged but not the submission of Assignments.
- All statistical code needs to be submitted as a txt file, For example, assignmet.sas.txt or assignment.R.txt.
- All submitted codes should be tested without any error. If there are any errors, the assignment will get zero credit.
- All Assignments should be uploaded to D2L before 5:30 PM of the due date
- Late submission will get steep penalty without prior approval by instructor.

### **GRADE**

Weekly Assignments (45%), Midterm Exam (25%), Final Project Presentation and Submission (30%)

Scale of grade: A: 93 or above, A-: 88-92.9, B+: 85-87.9, B: 80-84.9, B-: 77-79.9, C+: 75-76.9, C: 70-74.9, C-: 68-69.9, D+: 65-67.9, D: 60-64.9, F: Below 60

### **ACADEMIC HONESTY**

Work done for this course must adhere to the University Academic Integrity Policy. Violations include but are not limited to the following categories: cheating; plagiarism; fabrication and academic misconduct.

- Cheating: any action that violates University norms or an instructor's guidelines for the preparation and submission of assignments. Such actions may include using or providing unauthorized assistance or materials on course assignments, or possessing unauthorized materials during an examination.
- Plagiarism: the representation of others' work as your own. You are to prepare your own assignments. Violations may result in the failure of the assignment, failure of the course, and/or additional disciplinary actions.
- Misconduct: This includes but is not limited to attempts to bribe an instructor for academic advantage; persistent hostile treatment of, or any act or threat of violence against, an instructor, advisor or other students. Violations may result in additional disciplinary actions by other university officials and possible civil or criminal prosecution.

You may review the Academic Integrity Policy in the Student Handbook or by visiting Academic Integrity at DePaul University (<http://academicintegrity.depaul.edu>)

### **ATTENDANCE POLICY**

I do not take attendance. The attendance will be automatically checked by in-class lab reports.

Excuses on exam days may be considered under extraordinary circumstances provided by official documentation.

### **CLASSROOM RULES & PROFESSIONAL POINTS**

- Prohibitions: Cell phones must be turned OFF. Use of the internet is not permitted unless specifically directed by me. This includes checking of email and use of instant messengers. You must sit at the front of the classroom if you are using a computer. Tape recorders, unrelated reading materials, and food are also prohibited in the classroom.
- Behavior: You may not leave the classroom for any reason during an exam (go to the bathroom beforehand). Further, unprofessional behavior such as inappropriate chatting, leaving in the middle of class, or showing up excessively late, etc. are disruptive and unacceptable. If you need to leave class early, let me know in advance.
- For first time violations you will receive a warning. In the event that violations continue, I will ask you to leave the classroom. (I reserve the right to add to this list as situations arise.)

**STUDENT WITH DISABILITY:** Students with Disability may register the The Productive Learning Strategies (PLuS) Program. You may request your exam schedule arrangement by requesting through the PLuS program. For more information on the PLuS program, you may visit <http://studentaffairs.depaul.edu/plus/> or call: 312-362-8000.

## **TENTATIVE SCHEDULE OF TOPICS**

(The instructor may change the order or contents by needs, any special material needs for class will be available on D2L)

### **I. Introduction to Business Analytics and SAS**

- WEEK1: Introduction to Business Analytics (BA) and SAS Programming
  - Business Analytics, Data Analytics, and Big Data
  - SAS Data procedure syntax
  - SAS Descriptive Analytics
  - Assignment 1 (SAS Coding Assignment)

### **II. Advanced Topics in Descriptive Analytics**

- WEEK2: Statistics and Data Exploration for BA  
We will explore the topics on more issues on descriptive statistics and data issues using SAS. Following topics will be included:
  - Statistics and Inference: Descriptive Statistics, Inference, and Hypothesis Tests on Business Decision
  - Data Exploration and Sanitation: Understand the challenge of real data and enhance the ability to programming skills
  - Missing Value and Outlier Treatment
  - Assignment 2 (SAS Descriptive Analytics and Cleaning Data)
- WEEK3: Classification and Clustering Analysis  
Clustering Analysis in Big Data: Cluster effect depending upon geographical, political, and socio-economic environment. Since the process of identifying, defining and describing is not standard, the student will need to work on their own individual data to understand how to cluster their data for further data analysis.
  - K-Means
  - Hierarchical Clustering
  - Data Visualization and Statistics by Clustering
  - Assignment 3 (Clustering Analysis)

### **III. Predictive Analytics**

- WEEK4-5: Regression Models I  
Regression and forecasting techniques can yield new insight for managers by uncovering patterns and relationships that they had not previously noticed or considered. Student will learn how to make appropriate regression models to reach a business decision by allowing various alternative models.
  - Simple and Multiple regression models
  - Dummy and Categorical Variables

- Nonlinear and Functional Forms
- Regression Diagnostic Tests
- Prediction Power Tests
- Assignment 4, 5 (Regression Analysis)
- WEEK6: Midterm Exam and Introduction to R
  - Introduction to R for Predictive Analytics
  - Bring your own data (BYOD) proposal and data collection
  - Assignment 6 (Regression Analysis using R)
- WEEK7: Regression Analysis in Discrete Choice Model:
 

models might be used for supply chain, investment decision, response to marketing communication, payment of credit card, shoppers' brand choice model, consumer purchasing decision model, drug choice model, and readmission of patients in hospital.

  - Linear Probability Model
  - Binomial Logistic Regression
  - Assignment 7 (Discrete Choice Model)

#### **IV. Machine Learning (ML) and Unsupervised Models**

- WEEK8-9 Machine Learning (ML) Models
  - Random Forest Model (RFM) is a supervised classification algorithm. We can see it from its name, which is to create a forest by some way and make it random.
  - Neural Network Model (NNM) currently provide the best solutions to many problems in classification, clustering, and regression analysis. image recognition, speech recognition, and natural language processing. deep neural networks as components of larger machine-learning applications involving algorithms for reinforcement learning, classification and regression.
  - Assignment 8,9 (RFM, NNM)

#### **V. Case Study and Project Management**

- WEEK9 Project Management and Presentation
  - Case Study: Data Analytics and Strategy - Chicago Housing Price Models, Loan Performance Model
  - Descriptive, Predictive, Prescriptive Analysis using clustering, regression and machine learning models.
- WEEK10 Conference in class: A Group Project Presentations
 

Each group will present the topics of interest. This is a proposal presentation with some preliminary data and analytics. The project will start after midterm exam, and the related techniques will be developed throughout the class. If allowed, any students can bring their own data or any public data they are interested in.
- FINAL PROJECT DUE (November 26 (TUE) 10:00 PM)