SYRACUSE UNIVERSITY
WHITMAN SCHOOL OF MANAGEMENT

Course Syllabus

SCM 651 – Business Analytics

Textbooks: A series of books were used to develop this course from the list below and at the end of this syllabus. No books are required to be purchased for this course.

1. "Managerial Analytics: An Applied Guide to Principles, Methods, Tools, and Best Practices," December 2013, 1st Edition, Watson and Nelson (reference)
2. "A Practitioner's Guide to Business Analytics: Using Data Analysis Tools to Improve Your Organization's Decision Making and Strategy," 2013, Bartlett (reference)

Course Overview and Learning Objectives

This course is intended for the graduate student who is interested in developing a portfolio of skills in business analytics.

The course learning objectives include:

1. Data collection: using tools to collect and organize data (e.g., Google Analytics)
2. Data analysis: identify patterns in the data via visualization, statistical analysis, and data mining
3. Strategy and decisions: develop alternative strategies based on the data
4. Implementation: develop a plan of action to implement the business decisions

Class discussions will be based on case situations and on articles from business and technical publications. The class will include substantial hands-on work in data collection, analysis and interpretation.

Course Format

Classes will include a mixture of hands-on lab sessions and case discussions. The course readings will serve as the basis for live discussion on basic business analytics. Lab sessions focus on learning skills required for data analysis.

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Grading

Grades will be based on four components:

1. <u>Homework assignments (50%)</u>: There are 4 homework assignments focusing on the skills necessary to perform business analytics. Homework assignments are to be completed as a group assignment. No collaboration between teams is allowed on group assignments. Submitted assignments must be original work from the team. Every member of a group should submit the homework assignment.
2. <u>Team peer review (15%)</u>: The peer review score is your teammates' evaluation of your contribution to the group homework assignments. The average peer review score will be no higher than 80%.
3. <u>Final Exam (30%)</u>: The final exam is an individual assignment. No discussion or collaboration with anyone else is allowed. Exam submissions must be original work from the individual. The exam will be taken during the week 11 live session.
4. <u>Class participation (5%)</u>: You are expected to prepare for each class, participate actively in the discussion of material, and contribute to the learning experience of the group. Attendance does not count for participation, but participation is not possible without attendance. The average class participation score will be no higher than 80%.

Assignments

Assignment	Individual or Group	Percent Individual	Percent Group
1. Data visualization, correlation, and regression	Group		12.5 %
2. Google Analytics	Group		12.5 %
3. Demand modeling and price optimization	Group		12.5 %
4. Customer choice (logit, probit, neural networks)	Group		12.5 %
6. Team peer review	Individual	15 %	
7. Final Exam	Individual	30 %	
8. Class participation	Individual	5%	
Total		**50 %**	**50%**

Grading Curve

The projected grading curve is shown below. This curve may be adjusted depending on the class performance. The lower end of each grade range will not be raised (e.g., 95% will be an A, 92% will be at least an A-, etc.).

Grade Distribution	
A	95.0 – 100.0
A-	92.0 – 94.99
B+	90.0 – 91.99
B	82.0 – 89.99
B-	75.0 – 81.99
C+	72.0 – 74.99
C	65.0 – 71.99

If a student requests that part an assignment be re-graded, then the entire assignment will be re-graded. Historically, half of re-grades increase the score, half decrease the score.

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University and School Policies

Academic integrity policy

Syracuse University sets high standards for academic integrity. Those standards are supported and enforced by students, including those who serve as academic integrity hearing panel members and hearing officers. The presumptive sanction for a first offense is course failure, accompanied by the transcript notation "Violation of the Academic Integrity Policy." The standard sanction for a first offense by graduate students is suspension or expulsion. Students should review the Office of Academic Integrity online resource "Twenty Questions and Answers About the Syracuse University Academic Integrity Policy" and confer with instructors about course-specific citation methods, permitted collaboration (if any), and rules for examinations. The Policy also governs the veracity of signatures on attendance sheets and other verification of participation in class activities. Additional guidance for students can be found in the Office of Academic Integrity resource: 'What does academic integrity mean?'

This class will use the plagiarism detection and prevention system Turnitin. You will have the option to submit your papers to Turnitin to check that all sources you use have been properly acknowledged and cited before you submit the paper to me. I will also submit all papers you write for this class to Turnitin, which compares submitted documents against documents on the Internet and against student papers submitted to Turnitin at SU and at other colleges and universities. I will take your knowledge of the subject matter of this course and your writing level and style into account in interpreting the originality report. Keep in mind that all papers you submit for this class will become part of the Turnitin.com reference database.

A violation of the academic integrity policy, use of work not your own, or collaboration with others will result in a grade of zero on any assignment or exam where a violation is identified and will be reported to the academic integrity office.

Work produced by students as part of this course may be used for educational purposes

It is understood that registration for and continued enrollment in this course constitutes permission by the student to use his or her works for educational purposes. In compliance with the federal Family Educational Rights and Privacy Act, works in all media produced by students as part of their course participation at Syracuse University may be used for educational purposes, provided that the course syllabus makes clear that such use may occur.

Disability services

If you believe that you need accommodations for a disability, please contact the Office of Disability Services (ODS), http://disabilityservices.syr.edu, located in Room 309 of 804 University Avenue, or call (315) 443-4498 for an appointment to discuss your needs and the process for requesting accommodations. ODS is responsible for coordinating disability-related accommodations and will issue students with documented Disabilities Accommodation Authorization Letters, as appropriate. Since accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible.

Religious Observances

SU's religious observances policy, found at http://supolicies.syr.edu/emp_ben/religious_observance.htm, recognizes the diversity of faiths represented among the campus community and protects the rights of students, faculty, and staff to observe religious holy days according to their tradition. Under the policy, students are provided an opportunity to make up any examination, study, or work requirements that may be missed due to a religious observance provided they notify their instructors before the end of the second week of classes. For fall and spring semesters, an online notification process is available through MySlice/Student Services/Enrollment/My Religious Observances from the first day of class until the end of the second week of class. You are also welcome to contact me privately to discuss your academic needs although I cannot arrange for disability-related accommodations

Class Schedule

The topics, readings and assignments for each class session are listed on the following pages. Special topics will be added to the schedule as time permits.

Professionalism

To maintain a level of professionalism, cell phone usage is not permitted during regular class lectures sessions.

Other Issues

- For fairness reasons, there will be no additional assignment for extra credit. The best way to achieve a good grade is to put decent effort into each assignment.

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- **Class Schedule**

Session	Intensive	Assignments
Sunday Jan 5	**Prework: Course Background (watch videos 1.1 – 1.5)** • What is Business Analytics? • How can Business Analytics be applied? • Who uses Business Analytics? **Hands-on – Excel data manipulation and visualization** • Calculations and formulas • Graphing and visualization • Sorting and filters • Pivot tables and charts • 3D Maps • PowerView	**Review of syllabus and assignments** **Articles: see instructions on page 6** 1. Business Analytics Insight: Hype or Here to Stay? Hugh Watson, Business Intelligence Journal, 2015 2. GE and the Culture of Analytics, Renee Boucher Ferguson, MIT Sloan Management Review, January 2014 3. Location Analytics: Bringing Geography Back, Renee Boucher Ferguson, MIT Sloan Management Review, Oct 2012
Sunday Jan 5	**Hands-on – Excel financials** • Net Present Value (NPV) • Internal Rate of Return (IRR) **Hands-on – Excel statistics** • Descriptive statistics • Correlations • Univariate regression (linear, exponential, power) • Multivariate regression • Moving average	**Articles: see instructions on page 6** 1. Sustaining an Analytics Advantage, Peter Bell, MIT Sloan Management Review, Spring 2015 2. Creating Business Value with Analytics, David Kiron and Rebecca Shockley, MIT Sloan Review, Fall 2011 3. Raising the Bar with Analytics, David Kiron et al., MIT Sloan Management Review, Winter 2014
Monday Jan 6	**Hands-on – Excel sensitivity analysis** • Forecasting • Prediction Models • Sensitivity Analysis • Conditional Formatting • Scenario Manager **Hands-on – Google Analytics** • Audience • Acquisition • Behavior	**Homework #1: Regression due before start of class** **Articles: see instructions on page 6** 1. Web Analytics: Enhancing Customer Relationship Management, Nabil Alghalith, Journal of Strategic Innovation and Sustainability, May 2015 **2.** How eBay Uses Data and Analytics to Get Closer to Its (Massive) Customer Base, Renee Boucher Ferguson, MIT Sloan Management Review, June 2013
Monday Jan 6	**Hands-on - Excel optimization** • Goal seek • Unconstrained solver • Useful functions • Optimal product mix • Workforce scheduling • Transportation & distribution • Capital budgeting • Warehouse location	**Articles: see instructions on page 6** 1. Modern Analytics and the Future of Quality and Performance Excellence, James Evans, The Quality Management Journal, 2015 2. A Process of Continuous Innovation: Centralizing Analytics at Caesars, Renee Boucher Ferguson, MIT Sloan Management Review, July 2013

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Session	Intensive	Assignments
Tuesday Jan 7	**Hands-on - Access: Data structure and queries** • Importing data • Relationships between tables • Solving dirty data problems • Queries with Query Design	**Homework #2: Price Optimization due before start of class** **Articles: see instructions on page 6** 1. Minding the Analytics Gap, Sam Ransbotham et al., MIT Sloan Management Review, Spring 2015 2. Innovating with Analytics, David Kiron et al., MIT Sloan Mgt Review, Fall 2012
Tuesday Jan 7	**Hands-on – Excel: Power Query & Power Pivot** • Importing data • Relationships • Properties and filters • PowerQuery • PowerPivot tables • Slicers & Timelines • PowerPivot charts	**Articles: see instructions on page 6** 1. Innovating with Airborne Analytics, David Kiron, MIT Sloan Mgt Review, Fall 2015 2. A New, Analytics-Based Era of Banking Dawns at State Street, Renee Boucher Ferguson, MIT Sloan Mgt Review, summer 2014
Wednesday Jan 8	**Hands-on – Basic R** • Loading and viewing data • Histograms, boxplots, scatter plots, mean plots, XY plots • 3D graphs • Statistical summaries • Correlations • ANOVA • Regression, dummy variables, moderating effects	**Homework #3: Power Query due before start of class** **Articles: see instructions on page 6** 1. Big Data in Health Care: Using Analytics to Identify and Manage High-Risk and High-Cost Patients, David Bates et al., Health Affairs, 2014 2. A Review of Analytics and Clinical Informatics in Health Care, Allan Simpao et al, Journal of Medical Systems, April 2014
Wednesday Jan 8	**Hands-on – Advanced R** • Logit • Probit • Perceptrons • Neural Networks • Deep Learning • K-means analysis	**Articles: see instructions on page 6** 1. An introduction to data mining and other techniques for advanced analytics, Parry Leventhal, Journal of Direct, Data and Digital Marketing Practice, Oct-Dec 2010

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Session	Intensive	Assignments

Thursday
 Jan 9
	Hands-on – Intermediate R
	 • Regression diagnostics
	     ○ Linearity
	     ○ Multi-collinearity
	     ○ Heterscedasticity
	     ○ Serial Correlation
	     ○ Outliers
	 • Diagnostic corrections
	     ○ Box-Cox
	     ○ Box-Tidwell
	 • Principal component analysis/Factor analysis
	 • Benford's Law
	 Decision trees
		Homework #4: Customer Choice (logit & probit) due before start of class
		
		 Articles: see instructions on page 6
		 1. What Businesses Can Learn from Sports Analytics, Thomas Davenport, MIT Sloan Management Review, summer 2014
		 2. Team GB: Using Analytics (and Intuition) to Improve Performance, Renee Boucher Ferguson, MIT Sloan Management Review, Spring 2013

Thursday Jan 9	**Hands-on – Tableau** • Connecting to data • Creating relationships • Building worksheets • Geolocations • Calculations • Filters • Dashboards Tableau's data visualization software is provided through the Tableau for Teaching program. **Hands-on – MS Power BI**	**Articles: see instructions on page 6** 1. Business Analytics: Transforming the Role of Management Accountants, Kristine Brands, Management Accounting Quarterly, Spring 2015 2. Elevating Data, Analytics to the C-Suite, Renee Boucher Ferguson, MIT Sloan Management Review, Summer 2014
Friday Jan 10	**Final Exam – in class**	

Instructions to Access Articles at Syracuse Library

1. Go to https://library.syr.edu/
2. Click on Recommended Database: ProQuest
3. Log in with your Syracuse NetID (first part of your email address) and password
4. Search for the article using the title and author

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Reference Textbooks:

Excel

1. Microsoft Excel Data Analysis and Business Modeling (Winston)

Business Analytics (general)

1. "Managerial Analytics: An Applied Guide to Principles, Methods, Tools, and Best Practices," December 2013, 1st Edition, Watson and Nelson (recommended)
2. "A Practitioner's Guide to Business Analytics: Using Data Analysis Tools to Improve Your Organization's Decision Making and Strategy," 2013, Bartlett (recommended)
3. "Predictive Business Analytics: Forward Looking Capabilities to Improve Business Performance," 2014, Maisel, Cokins
4. "Big Data and Business Analytics," 2013, Jay Liebowitz
5. "Big Data Analytics with R and Hadoop," 2013, Vignesh Prajapati
6. "Competing on Analytics: The New Science of Winning," 2007, Thomas H. Davenport
7. "Business Intelligence," 2011, Jerzy Surma
8. "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses," 2013, Minelli, Chambers
9. "Big Data Analytics: Disruptive Technologies for Changing the Game," 2013, Arvind Sathi
10. "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die," 2013, Siegel, Davenport
11. "Modeling Techniques in Predictive Analytics: Business Problems and Solutions with R," 2013, Thomas W. Miller
12. "Decision Analytics: Microsoft Excel," 2013, Conrad Carlberg
13. "Data Science for Business: What you need to know about data mining and data-analytic thinking," 2013, Provost, Fawcett
14. "Getting Started with Business Analytics: Insightful Decision-Making," 2013, Hardoon, Shmueli
15. "Win with Advanced Business Analytics: Creating Business Value from Your Data," 2012, Isson, Harriott

Data Visualization

1. "The Visual Display of Quantitative Information," 2001, Edward R. Tufte
2. "Now You See It: Simple Visualization Techniques for Quantitative Analysis,"2009, Stephen Few
3. "An Introduction to R for Spatial Analysis and Mapping," 2015, Chris Brunsdon, Lex Comber

Statistics

1. "R for Everyone: Advanced Analytics and Graphics," 2013, Jared P. Lander
2. "R for Business Analytics," 2012, A. Ohri
3. "Introductory Statistics with R," 2008, Peter Dalgaard
4. "Discovering Statistics Using R," 2012, Field, Miles, Field

SQL

1. "SQL in 10 Minutes, Sams Teach Yourself," 2012, Ben Forta
2. "SQL Database for Beginners," 2014, Martin Holzke, Tom Stachowitz
3. "SQL Quickstart Guide: The Simplified Beginner's Guide to SQL," 2015, ClydeBank Technology
4. "SQL Guide (Quickstudy: Computer) Pamphlet," 2005, Inc. BarCharts

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Dashboards

1. "Microsoft Excel Dashboards and Reports," 2013, Michael Alexander & John Walkenbach
2. "Dashboarding and Reporting with Power Pivot and Excel," 2014, Kasper de Jonge
3. "Communicating Data with Tableau," 2014, Ben Jones
4. "Tableau Your Data!" 2013, Dan Murray
5. "Tableau 8: The Official Guide," 2013, George Peck

Data Mining

1. "Data Mining and Business Analytics with R," 2013, Johannes Ledolter
2. "Data Mining Applications with R," 2013, Yanchang Zhao, Yonqhua Cen
3. "R and Data Mining: Examples and Case Studies," 2012, Yanchang Zhao
4. "Data Mining with R: Learning with Case Studies," 2010, Luis Torgo
5. "Data Mining: Practical Machine Learning Tools and Techniques," 2011, Witten, Frank, Hall
6. "RapidMiner: Data Mining Use Cases and Business Analytics Applications," 2013, Hofmann, Klinkenberg
7. "Data Mining for the Masses," 2012, Matthew A. North
8. "Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner," 2010, Shmueli, Patel, Bruce

Google Analytics

1. "Sams Teach Yourself Google Analytics in 10 Minutes," 2011, Michael Miller
2. "Advanced Web Metrics with Google Analytics," 2012, 3rd Edition, Brian Clifton
3. "Google Analytics," 2010, Justin Cutroni
4. "Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity," 2009, Avinash Kaushik

Accounting Analytics

1. "Forensic Analytics: Methods and Techniques for Forensic Accounting Investigations," 2011, Mark Nigrini
2. "Using Analytics to Detect Possible Fraud: Tools and Techniques," 2013, Pamela S. Mantone

Entrepreneurship Analytics

1. "Lean Analytics: Use Data to Build a Better Startup Faster," 2013, Croll, Yoskovitz

Marketing Analytics

1. "Cutting Edge Marketing Analytics: Real World Cases and Data Sets for Hands On Learning," to be published May 2014, Venkatesan, Farris, Wilcox
2. Customer and Business Analytics: Applied Data Mining for Business Decision Making Using R," 2012, Putler, Krider
3. "Marketing Analytics: Data-Driven Techniques with Microsoft Excel," 2014, Wayne L. Winston
4. "Marketing Analytics: Strategic Models and Metrics," 2013, Stephan Sorger
5. "Digital Marketing Analytics: Making Sense of Consumer Data in a Digital World," 2013, Hemann, Burbary
6. "Principles of Marketing Engineering," 2012, Lilien, Rangaswamy, DeBruyn

Supply Chain Analytics

1. "Supply Chain Planning and Analytics: The Right Product in the Right Place at the Right Time," 2011, Gerald Feigin