Newhouse, Melissa A.

From: West, Patricia
Sent: Monday, November 10, 2014 10:49 AM
To: Smith, William R. (Randy)
Cc: Newhouse, Melissa A.; McDonald, Melinda; Makhija, Anil
Subject: UG Business Analytics Proposal
Attachments: BA Minor Final + Letter.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Randy,

The Fisher College of Business is proposing adding a new undergraduate minor in Business Analytics (see attached). This minor will provide undergraduate business students, and others not majoring in Data Analytics, the opportunity to gain exposure to and build competence in this new and important area. Our plan is to launch the new minor in Autumn 2015, contingent on CAA approval.

We look forward to hearing feedback on the proposal.

Best,
Pat West

THE OHIO STATE UNIVERSITY
FISHER COLLEGE OF BUSINESS

Patricia M. West, PhD
Associate Dean of Undergraduate Programs
Associate Professor of Marketing
Fisher 544, 2100 Neil Avenue, Columbus, OH 43210
614-292-0568 Office | 614-949-7594 Mobile | 614-292-0879 Fax
west.284@fisher.osu.edu fisher.osu.edu
Friday, November 7, 2014

Vice Provost W. Randy Smith
Council on Academic Affairs
Office of Academic Affairs
203 Bricker Hall
190 North Oval Mall
Columbus, OH 43210

Dear Randy,

In an effort to address the university-wide data analytics initiative, the Fisher College of Business has participated in the development of the new Interdisciplinary major in Data Analytics by offering a specialization in 'Business Analytics' that is open to undergraduate students in this Arts & Sciences major. In addition, we are proposing an undergraduate minor in Business Analytics that will provide undergraduate business students, and others not majoring in Data Analytics, the opportunity to gain exposure to and build competence in this new and important area.

The Business Analytics minor consists of three required business courses and an additional six credit hours of elective coursework from business, statistics or computer science. The proposed minor leverages courses designed for the Data Analytics major and existing business courses. It is designed to address a talent gap for skilled managers and business analysts.

We are planning to launch the new Business Analytics minor in Autumn 2015, contingent on CAA approval.

Sincerely,

Patricia M. West, Ph.D.
Associate Dean of Undergraduate Programs
Associate Professor of Marketing
544 Fisher Hall
2100 Neil Avenue
Columbus, OH 43210-1144

614-292-0568 Phone
614-292-0879 Fax

fisher.osu.edu
Business Analytics Minor Proposal

Greg Allenby  
Helen C. Kurtz Chair in Marketing

Ralph Greco  
Director of Business Analytics Initiative

Waleed Muhanna  
Department Chair of Accounting & MIS

Dave Schilling  
Professor of Management Science

Patricia West  
Associate Dean of Undergraduate Programs
1. Executive Summary

In an effort to address the university-wide data analytics initiative, the Fisher College of Business has participated in the development of the new Interdisciplinary major in Data Analytics by offering a specialization in ‘Business Analytics’ that is open to undergraduate students in this Arts & Sciences major. The proposed undergraduate minor in Business Analytics will provide undergraduate business students, and others not majoring in Data Analytics, the opportunity to gain exposure to and build competence in this new and important area.

Business Analytics is the process of transforming data into insights for making better business decisions. This minor will provide students with an understanding of how to extract patterns to predict behavior and other business outcomes, and the ability to make informed decisions using a data-driven approach. The proposed Business Analytics minor is designed to leverage existing courses as well as new courses developed for the Data Analytics major and to provide more students the opportunity to complement their major with skills in business analytics. The curriculum is designed with extensive input from industry, including: IBM, JPMorgan Chase, Scotts, Teradata, Cardinal Health, and DSW, all of whom are interested in hiring individuals who are up to speed in working with ‘big data.’

2. Rationale

A widely cited 2011 McKinsey Global Institute (MGI) report titled “Big data: The next frontier for innovation, competition and productivity” projects a talent gap by 2018 whereby the United States alone may face a 50 to 60 percent shortfall (140,000 to 190,000 people) between the supply and demand for people with the training needed in advanced statistics and machine learning. The new interdisciplinary Data Analytics major through Arts & Sciences directly addresses the need for data scientists with deep analytical training in multiple industries including: actuarial science, economics, epidemiology, industrial engineering, mathematics, operations research, and statistics. In the same report, MGI estimates a shortage of “1.5 million managers and analysts with the know-how to use the analysis of big data to make effective decisions.” Big data talent is categorized into three groups that include: deep analysts, big data savvy, and supportive technology (see Exhibit A10 from the report below). These 1.5 million skilled managers and business analysts, who are expected to fall into the ‘big data savvy’ and ‘supportive technology’ groups are the people this minor is designed to train.

3. Students Served

While the Data Analytics major is designed for students seeking advanced training in mathematics, statistics, and computer science; the Business Analytics minor will provide an alternative pathway primarily for students pursuing a degree in business, engineering, actuarial science, mathematics, economics or computer science. The minor will be targeted at these populations because the prerequisite coursework lends itself well to these fields of study, which will require background in mathematics, statistics, economics and computer programming.

While initially we expect primarily business students to participate, the Fisher advising staff will share information about the minor with advisors around campus to create awareness of the opportunity. Detailed information will be made available on the Fisher website.
Exhibit A10

Big data talent is grouped into deep analytical, big data savvy, and supporting technology

<table>
<thead>
<tr>
<th>Definitions</th>
<th>Deep analytical</th>
<th>Big data savvy</th>
<th>Supporting technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>People who have advanced training in statistics and/or machine learning and conduct data analysis</td>
<td>People who have basic knowledge of statistics and/or machine learning and define key questions data can answer</td>
<td>People who service as database administrators and programmers</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Occupations¹</th>
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<tbody>
<tr>
<td>Actuaries</td>
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<tr>
<td>Mathematicians</td>
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<tr>
<td>Operations research analysts</td>
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<tr>
<td>Statisticians</td>
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<td>Mathematical technicians</td>
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<td>Mathematical scientists</td>
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<td>Industrial engineers</td>
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<tr>
<td>Epidemiologist</td>
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<td>Economists</td>
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<td>Business and functional managers</td>
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<td>Budget, credit and financial analysts</td>
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<td>Engineers</td>
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<td>Life scientists</td>
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<td>Market research analysts</td>
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<td>Survey researchers</td>
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<td>Industrial-organizational psychologists</td>
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<td>Sociologist</td>
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<td>Computer and information scientists</td>
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<tr>
<td>Computer programmers</td>
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<tr>
<td>Computer software engineers for applications</td>
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<tr>
<td>Computer software engineers for system software</td>
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<tr>
<td>Computer system analysts</td>
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<tr>
<td>Database administrators</td>
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</tr>
</tbody>
</table>

These occupations comprise 61 occupations in the SOC across 170 industries as defined by the North American Industry Classification System (NAICS)

¹ Occupations are defined by the Standard Occupational Code (SOC) of the US Bureau of Labor Statistics and used as the proxy for types of talent in labor force.

4. Learning Objectives

Business analysts and data-savvy managers need well-honed critical thinking, problem solving and decision making skills. Consistent with the Data Analytics major, a three-stage framework is used to build these skills.

Students graduating with a minor in Business Analytics will meet the following learning objectives:

1. Students will demonstrate an understanding of how data acquisition and analysis is done in organizations to meet a specified set of objectives.

2. Students will demonstrate critical thinking associated with: problem identification, decision making, assessing value propositions supported by data, and generating a logical synthesis of information from data.

3. Students will demonstrate an understanding of and ability to detect patterns in data, draw inferences and conclusions supported by the data, and communicate insights through visualization and written reporting.

4. Students can identify and assess ethical issues surrounding data-informed decision-making.
5. Course Requirements

The Business Analytics minor will consist of 15 credit hours of coursework. A minimum of 9 credit hours in the minor must be from Fisher College of Business.

Required Courses – 9 credit hours

**BUSMGT 3331: Business Analytics: Data Management & Descriptive Analytics**
Credits: 3; Prerequisites: Econ 2001.01 or equiv. and Econ 2002.02 or equiv. and Math 1152 or equiv. and STAT 3202 or equiv. and CSE 2111 or equiv.

This course will provide students with an understanding of how organizations can successfully collect, organize, manipulate, use, prospect and present data.

**BUSMGT 3332: Business Analytics: Application of Predictive Analytics to Business Data**
Credits: 3; Prerequisites: Econ 2001.01 or equiv. and Econ 2002.02 or equiv. and Math 1152 or equiv. and Stat 3202 or equiv. and CSE 2111 or equiv.

Students will learn in a hands-on manner how to build and test predictive models that move from data to parameter estimation. State-of-the-art software will be used to detect patterns in data, draw inferences and conclusions supported by the data.

**BUSMGT 3333: Business Analytics: Prescriptive Analytics and Optimization**
Credits: 3; Prerequisites or concurrent: BUSMGT 3331 and BUSMGT 3332, or CSE 5243 and STAT 3302

Students in this course will learn how to move from model parameters to decisions. An emphasis is placed on optimization business decisions that include: allocation of resources, profit and loss functions, counterfactual analysis, etc. Simulation methods, causal inference, and sampling issues will be discussed.
Selective Courses – 6 credit hours

Business Analytics Industry Cluster

BUSADM 3630.05(E): Introduction to Business Analytics: Defining & Applying “Big Data”
Credits: 2 or 3; Admission to Business Industry Clusters Program, or permission of instructor
Familiarize students with the concept of data analytics and its applicability in a business environment.

BUSADM 3632.05(E): Introduction to Business Analytics: Design and Development of Business Analytics Solutions
Credits: 3; Prerequisites: BUSADM 3630.05 and enrollment in Business Industry Cluster Program
Students will continue to learn topics in business analytics while they work on industry-sponsored projects in teams.

Data Mining

ACCTMIS 4210: Financial Statement Analysis
Credits: 3; Prerequisites: ACCTMIS 3201
Contemporary topics in financial accounting and analysis.

ACCTMIS 4620: Analysis and Design of Management Information Systems
Credits: 3; Prerequisites: CSE 3232, BUSMGT 2320 or equiv., BUSMGT 2321 or equiv.
Investigation and application, through real-world projects, of concepts and tools used in the analysis and design of management information systems.

ACCTMIS 4650: Decision Support and Expert Systems
Credits: 3; Prerequisites: CSE 3232, BUSMGT 3331 or BUSMGT 2320 or equiv. and BUSMGT 2321 or equiv.
Study of computer-based systems designed to support decision making within an organization.

CSE 3241: Introduction to Database Systems
Credits: 3; Prerequisites: CSE 2133 or CSE 2231, and CSE 2321 or Math 2366, Not open to students with credit for 5241
Database systems use, logical design, entity-relationship model, normalization, query languages and SQL, relational algebra and calculus, object relational databases, XML, active databases; database design project.

CSE 5243: Introduction to Data Mining
Credits: 3; Prerequisites: CSE 2331 and CSE 3241
Knowledge discovery, data mining, data preprocessing, data transformations; clustering, classification, frequent pattern mining, anomaly detection, graph and network analysis; applications.
Customer Insights & Analytics

**BUSML 4202: Marketing Research**  
Credits: 3; Prerequisites: BUSML 3250

Course examines the role of marketing research in the formulation and solution of marketing problems. Emphasis is placed on problem formulation, research design, data collection methods (instruments, sampling, operations) and analysis techniques.

**BUSML 4210: Advanced Marketing Research**  
Credits: 1.5; Prerequisites: BUSML 4201 and BUSML 4202

Applications of modern marketing research procedures to variety of marketing problems. Emphasis placed on survey design and sampling, attitude measurement, perceptual mapping, market segmentation, conjoint analysis, and measurement of customer satisfaction.

**BUSML 4211: Market Analysis, Development & Forecasting**  
Credits: 1.5; Prerequisites: BUSML 4201 and BUSML 4202

Before a new product can be launched, or new customers targeted a firm must assess the size and demand for an offering. Methods used to forecast consumer behavior, market share, and sales (for production and inventory control) will be examined.

**BUSML 4212: Customer Relationship Management**  
Credits: 1.5; Prerequisites: BUSML 4201 and BUSML 4202

Examines the theories of methods used to identify profitable customers, understand their needs and wants, and how to build a bond with them by developing customer-centric products and services directed toward providing customer value.

**BUSML 4232: Digital Marketing**  
Credits: 1.5; Prerequisites: BUSML 4201 and BUSML 4202

This course examines the how marketers can utilize emerging media (electronic, online, social and mobile) to promote customer engagement, enhance their traditional marketing mix, and measure the effectiveness of marketing efforts.
Operations Research & Logistics

BUSMGT 4233: Information Systems in Operations Management
Credits: 3; Prerequisites: 3230
This course offers a study of the information systems and modeling tools used in operations management. Emphasis is spreadsheet and database applications.

BUSMGT 4250: Six Sigma Principles
Credits: 3; Prerequisites: BUSMGT 2320 and BUSMGT 3230
Designed to familiarize students with the Six Sigma process improvement methodology and to provide them an opportunity to practice using Six Sigma Black Belt tools.

BUSMGT 4251: Six Sigma Projects
Credits: 3; Prerequisites: BUSMGT 4250
Six Sigma Capstone Projects.

BUSML 4382: Logistics Analysis
Credits: 3; Prerequisites: BUSMGT 2320 or equiv., BUSMGT 2321 or equiv.
Will equip student with the skills recognize, analyze and solve problems in the operation of a logistics system through forecasting, optimization and simulation techniques.

Statistical Modeling

STAT 3301: Modeling for Discovery I
Credits: 3; Prerequisites: STAT 3202 and MATH 2568; or permission of instructor
Statistical models for data analysis and discovery in big-data settings, with primary focus on linear regression models. The challenges of building meaningful models from vast data are explored, and emphasis is placed on model building and the use of numerical and graphical diagnostics for assessing model fit. Interpretation and communication of the results of analyses is emphasized.

STAT 3302: Modeling for Discovery II
Credits: 3; Prerequisites: STAT 3301, or permission of instructor
Statistical models for data analysis and discovery in big-data settings. The regression methods developed in Stat 3301 are extended to data settings with binary and multi-category outcomes. An introduction to some of the most commonly used statistical methods for exploring and analyzing multivariate data is provided. Interpretation and communication of the results of analyses is emphasized.

STAT 3303: Bayesian Analysis and Statistical Decision Making
Credits: 3; Prerequisites: STAT 3202, or permission of instructor
Introduction to concepts and methods for making decisions in the presence of uncertainty. Topics include: formulation of decision problems and quantification of their components; learning about unknown features of a decision problem based on data via Bayesian analysis; characterizing and finding optimal decisions. Techniques and computational methods for practical implementation are presented.
5. Projected Enrollment

The Business Analytics minor is designed to scale based on demand by utilizing a straightforward structure of courses that includes three required courses offered within Fisher. In its first year, we anticipate 50 students starting the minor. These will primarily be business students. Initially, one section of each of the required courses will be offered a year. As the demand increases we will expand the number of sections of the business courses and work with the Statistics department to expand the number of sections of the statistical modeling courses, as needed. All but three of the selective courses are already being offered within existing business specializations. Students will have multiple courses to choose from each semester to complete the minor.

6. Curriculum Map

The four learning objectives identified earlier will be achieved through the required coursework with students starting from a beginning (B) level of proficiency in the pre-requisite coursework in statistics and computer science, through an intermediate (I) level of proficiency, and finally achieving an advanced (A) level of proficiency.

The following table illustrates how skills associated with: critical thinking, pattern detection, inference generation, data-informed decision making, and effective communication of insights will develop. Ethical issues surrounding the gathering, analysis and utilization of data will be discussed in all required courses to reinforce its importance.

<table>
<thead>
<tr>
<th>Course</th>
<th>Objective 1</th>
<th>Objective 2</th>
<th>Objective 3</th>
<th>Objective 4</th>
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<tbody>
<tr>
<td>STAT 3201: Intro to Probability for Data Analytics</td>
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<td>B</td>
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<tr>
<td>STAT 3202: Intro to Statistical Inference for Data Analytics</td>
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<td>B</td>
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<tr>
<td>BUSMGT 3331: BA: Data Mgt. &amp; Descriptive Analytics</td>
<td>B</td>
<td>I</td>
<td>I</td>
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<tr>
<td>BUSMGT 3332: BA: Applications of Predictive Analytics</td>
<td>I</td>
<td>I</td>
<td>A</td>
<td>I</td>
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<tr>
<td>BUSADM 3333: BA: Prescriptive Analytics &amp; Optimization</td>
<td>A</td>
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</tbody>
</table>

7. Approvals and Concurrence

A team of individuals in Fisher College has developed the requirements for this minor. These individuals include: Greg Allenby, Helen C. Kurtz Chair in Marketing, Ralph Greco, Director, Business Analytics Initiative, Waleed Muhanna, Department Chair of Accounting & Mgt. Information Systems, Dave Schilling, Professor of Management Science, Patricia West, Associate Dean of Undergraduate Programs.

A subgroup has met with Christopher Hans in the Department of Statistics, Srini Parthasarathy in the Department of Computer Science and Engineering and Phil Smith in Integrated Systems Engineering to seek approval for including their department courses in the Business Analytics minor curriculum. Letters of support from each department are included.
8. Appendices

BSBA Advising Sheet

Arts & Sciences Minor Sheet

Course Syllabi
  • BUSMGT 3331: Business Analytics: Data Management & Descriptive Analytics
  • BUSMGT 3332: Business Analytics: Applications of Predictive Analytics to Business Data
  • BUSMGT 3333: Business Analytics: Prescriptive Analytics & Optimization

Letters of Support
  • College of Arts & Sciences
    - Department of Statistics
  • College of Engineering
    - Computer Science & Engineering

Undergraduate Program Committee Approval: 9.27.14
Executive Committee Approval: 10.7.14
B.S. Business Administration  
Specialization with Business Analytics Minor

2015 – 2016 Academic Year

Student Information

Name: ____________________________  OSU ID: __________________  OSU Admit Term: _____
Phone: ____________________________  Email (name.number@osu.edu)

Suggested Curriculum
This should be used as a guide only. Semester offerings are subject to change.

<table>
<thead>
<tr>
<th>Year</th>
<th>Autumn</th>
<th>Spring</th>
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<tbody>
<tr>
<td>1</td>
<td>___ SURVEY I</td>
<td>1 hr ___ GE Science</td>
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<td></td>
<td>___ ENGLISH 1110.x</td>
<td>3 hr ___ MATH 1152</td>
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<td></td>
<td>___ MATH 1151</td>
<td>5 hr ___ ECONOMICS 2002.01</td>
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<td>___ ECONOMICS 2001.01</td>
<td>3 hr ___ GE A&amp;H II</td>
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<td>___ GE A&amp;H I</td>
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<td>___ ACCTMIS 2200</td>
<td>3 hr ___ ACCTMIS 2300</td>
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<td>___ BUSMHR 2000/BUSFIN 3500</td>
<td>3 hr ___ GE Global Studies I</td>
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<td>___ GE Science</td>
<td>5 hr ___ GE A&amp;H III</td>
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<td>___ BUSMGT 3331</td>
<td>3 hr ___ BUSMGT 3333</td>
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<td>___ BUSMGT 3332</td>
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<td>3 hr ___ BUS Specialization Course</td>
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<td>___ BUS Specialization Course</td>
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<td>___ BUS Specialization Course</td>
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<td>3 hr ___ GE A&amp;H IV</td>
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<td>___ GE Social Diversity</td>
<td>3 hr ___ GE Global Studies II</td>
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(Allowing for 21 credits toward major coursework)  

Total Credit Hours = 125.5

[STAT 3201, STAT 3202 and BUSMGT 3331 will replace STAT1430, BUSMGT 2320 and BUSMGT 2321]
The Undergraduate Minor in Business Analytics is offered through the Fisher College of Business. Designed to provide undergraduate business students, and others not majoring in Data Analytics, the opportunity to gain exposure to and build competence in business analytics. This minor will provide an understanding of how to extract patterns to predict behavior and other business outcomes, and the ability to make informed decisions using a data-driven approach.

This minor requires the successful completion of a minimum of 15 hours and five courses. A minimum of 9 credit hours in the minor must be from the Fisher College of Business. Credit hours and prerequisites for each course are listed following the course title.

**Required Courses**

- **BUSMHR 3331 – Business Analytics: Data Management & Descriptive Analytics**
  - Credits: 3; Prerequisites: Econ 2001.01 or equiv. and Econ 2002.02 or equiv. and Math 1152 or equiv. and Stat 3202 or equiv. and CSE 2111 or equiv.

- **BUSMGT 3332 – Business Analytics: Application of Predictive Analytics to Business Data**
  - Credits: 3; Prereq: Econ 2001.01 or equiv. and Econ 2002.02 or equiv. and Math 1152 or equiv. and Stat 3202 or equiv. and CSE 2111 or equiv.

- **BUSMGT 3333 – Business Analytics: Business Analytics: Prescriptive Analytics and Optimization**
  - Credits: 3; Prereq or concurrent: BUSMGT 3331 and BUSMGT 3332 or CSE 5243 and STAT 3302

**Elective Courses**

The minor requires students to successfully complete six credit hours of selective courses.

- **Business Analytics Industry Cluster**
  - BUSADM 3630.05/3630.05E – Credits: 2 or 3
  - BUSADM 3632.05/3632.05E – Credits: 3

- **Data Mining**
  - ACCTMIS 4210 – Credits: 3; Prereq: ACCTMIS 3201
  - ACCTMIS 4620 – Credits: 3; Prereq: CSE 3232, BUSMGT 2320 or equiv., BUSMGT 2321 or equiv.
  - ACCTMIS 4650 – Credits: 3; Prereq: CSE 3232, BUSMGT 2320 or equiv., BUSMGT 2321 or equiv.
  - CSE 3241 – Credits: 3; Prereq: CSE 2133 or CSE 2231, and CSE 2321 or Math 2366. Not open to students with credit for 5241
  - CSE 5243 – Credits: 3; Prerequisites: CSE 2331 and CSE 3241

- **Customer Insights & Analytics**
  - BUSML 4202 – Credits: 3; Prereq: BUSML 3250
  - BUSML 4210 – Credits: 1.5; Prereq: BUSML 4201, BUSML 4202
  - BUSML 4211 – Credits: 1.5; Prereq: BUSML 4201, BUSML 4202
  - BUSML 4212 – Credits: 1.5; Prereq: BUSML 4201, BUSML 4202
  - BUSML 4232 – Credits: 1.5; Prereq: BUSML 4201, BUSML 4202

- **Operations Research & Logistics**
  - BUSMGT 4233 – Credits: 3; Prereq: 3230
  - BUSMGT 4250 – Credits: 3; Prereq: BUSMGT 2320 and BUSMGT 3230
  - BUSMGT 4251 – Credits: 3; Prereq: BUSMGT 4250
  - BUSML 4382 – Credits: 3; Prereq: BUSMGT 2320 and BUSMGT 2321

- **Statistical Modeling**
  - STAT 3301 – Credits: 3; Prereq: STAT 3202 and MATH 2568; or permission of instructor
  - STAT 3302 – Credits: 3; Prereq: STAT 3301, or permission of instructor
  - STAT 3303 – Credits: 3; Prereq: STAT 3202, or permission of instructor

**Undergraduate Minor in Business Analytics Guidelines**

The following guidelines govern the minor:

- **Required for graduation:** No
- **Credit hours required:** Minimum of 15
- **Transfer credit hours allowed:** A maximum of 3
- **Overlap with major and additional minor(s):**
  - The minor must be in a different subject than the major
  - Each minor completed must contain 12 unique hours

- **Grades required:**
  - Minimum C- for a course to be listed on the minor.
  - Minimum 2.00 cumulative point-hour ratio required for the minor.
  - Course work graded Pass/Non-Pass cannot count on the minor.

- **Minor Approval**
  - The Business Analytics Minor does not have an application process. In order to graduate with Business Analytics Minor, you must meet the guidelines listed on the curriculum requirements. Upon completing the requirements, a student needs only to file the Business Analytics Minor Program Form with their college office. No approval from Fisher College of Business is required.

- **Filing the minor program form**
  - The minor program form must be filed at least by the time the graduation application is submitted to the college.

- **Changing the minor**
  - Once the minor program is filed in the college office, any changes must be approved by the academic unit offering the minor.

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College of Arts and Sciences
Curriculum and Assessment Services
154 Denny Hall, 164 W. 17th Ave, http://artsandsciences.osu.edu
Update 10/18/2014
BUSMGT 3331
Business Analytics: Data Management and Descriptive Analysis

Context
- 14 weeks, 3 hours per week
- 3 credits
- Target: Undergraduate students seeking a minor in Business Analytics, across colleges and majors
- Required course in the 15 credit Business Analytics minor
- Prerequisites: ECON 2001.01 or equiv., ECON 2002.02 or equiv., MATH 1152 or equiv., STAT 3202 or equiv. and CSE 2111 or equiv.

Course Objective
To understand how organizations can successfully collect, organize, manipulate, use and present data.

Learning Objectives
Students will understand principles and concepts of business analytics that allow for data-informed decision-making:
- Learn about the stages involved in business analytics
- Understand how data is acquired, stored, manipulated and queried
- Demonstrate the ability to prepare and clean data for analysis
- Learn principles and techniques for visually representing and reporting data

Learning Outcomes
Student learning will be measured and a course grade determined by:
- Homework assignments 25%
- Exams 50%
- Team report 25%
Topics

This course contains 8 topics:

Topic I: Business Analytics Framework: Description, Prediction and Prescription
- Business Intelligence as a Guiding Principle
- What makes Data “Big” – Relative Scope and Velocity; Broad Challenges
- Deloitte/OSU Working Framework for Analytics

Topic II: The Data Universe
- What data resources managers have available to them
- Enterprise Systems and Data Warehouses
- External sources on the Internet and the Cloud

Topic III: Data Acquisition
- Reading and Parsing Consistently Delimited Data
- Microsoft BI: PowerPivot and SQL
- Querying Semi-structured content

Topic IV: Data Manipulation
- Data Aggregation
  - Common Tools Methods
  - Caveats: What is Lost and Gained?
- Cleaning Messy Data and Common Transforms/Logic in Recoding

Topic V: Working with and Connecting Unstructured Data
- Converting real-world problems into logical and mathematical forms
- Supplying simply models with associated critical data
- An introduction to techniques for drawing conclusions and prescriptions from models and understanding associated risk.
- An introduction to associated tools for analysis:
  - R(RExcel), Solver, RiskOptimizer

Topic VI: Data Visualization for Analysis
- The role of confirmatory visualization for a manager
- The role of exploratory visualization for a manager
- Visualizing distributions of data, uncertainty/risk
- Visualizing areas of effect and geographic distinctions
- Visualizing multi-dimensionality (and group-wise distinctions)

Topic VII: Data Visualization for Communication and Comprehension
- Principles of strong visual communication
  - Audience and “context of use” identification
  - Robustness and clarity
- Common traps
Topic VIII: Beyond Static Reporting: Building Data Interfacing Tools
- Knowing the resources available to your audience
- Appreciating the value that specific, customizable tools to enhance business intelligence might bring to a specific audience
- Automatic data analytic processes by simple subroutines
- Dashboard development and basic GUIs

Readings

BUSMGT 3332
Business Analytics: Application of Predictive Analytics to Business Data

Context

- 14 weeks, 3 hours per week
- 3 credits
- Target: Undergraduate students seeking a minor in Business Analytics, across colleges and majors
- Required course in the 15 credit Business Analytics minor
- Prerequisites: ECON 2001.01 or equiv., ECON 2002.02 or equiv., MATH 1152 or equiv., STAT 3202 or equiv. and CSE 2111 or equiv.

Course Objective

To learn how to build and test predictive models that move from data to parameter estimation.

Learning Objectives

Students will understand principles and concepts of business analytics that allow for data-informed decision-making:

- Learn to use state-of-the-art software that allows for detecting patterns in data
- Develop the critical thinking skills to make appropriate inferences and conclusions supported by data
- Build and test predictive models using sound statistical methodology
- Understand how to estimate and interpret model parameters

Learning Outcomes

Student learning will be measured and a course grade determined by:

- Homework assignments  25%
- Exams                50%
- Team report           25%
Topics

Topic 1: The likelihood principle
   The data-generating mechanism
   Parameter inference and prediction

Topic 2: Brief review of regression analysis
   Data generation in R, inference and prediction
   Regression for business problems:
   - Accounting, Finance, Human Resources, Marketing, Production

Topic 3: Discrete data
   Censored regression models
   - Tobit style models
   - Binomial, multinomial and order regression models
   Text analysis
   - Using regression with dummy variables (Satisfaction surveys)
   - LDA and ATM models (Text mining)
   Discrete data applications in business
   - Accounting, Human Resources, Marketing

Topic 4: High dimensional data
   Techniques for variable reduction
   - Principal components and factor analysis
   - Aggregation and index models
   Models of variable selection
   - Variable selection
   - Lasso
   Theoretical models
   - Economics at work
   High dimensional problems in business
   - Finance, Production

Topic 5: Longitudinal analysis
   Time series analysis

Topic 6: Cross-sectional analysis
   Hierarchical models

Readings

Course packet will be used
BUSMGT 3333
Business Analytics: Applied Prescriptive Analytics

Context
- 14 weeks, 3 hours per week
- 3 credits
- Target: Undergraduate students seeking a minor in Business Analytics, across colleges and majors
- Required course in the 15 credit Business Analytics minor
- Prerequisites: BUSMGT 3331 and BUSMGT 3332 or CSE 5243 and STAT 3302

Course Objective
Moving from estimating model parameters, to making data-informed business decisions.

Learning Objectives
Students will understand principles and concepts of business analytics that allow for:
- Understand endogeneity and sampling issues common in business settings
- Know how to move beyond model parameters
- Optimizing decisions
- Consideration of economic and business-related profit and loss functions
- Using simulation methods to facilitate business decision making

Learning Outcomes
Student learning will be measured and a course grade determined by:
- Homework assignments 25%
- Exams 50%
- Team report 25%
Topics

This course contains 5 topic areas:

**Topic I:** Prescriptive Analytics and Data and Data Science
- Scientific method in business
- Hierarchical models

**Topic II:** Threats to Inference, Intervention and Causality
- Sampling and representativeness
- Randomization and self-selection
- Explanatory variables
- Endogeneity
- Counterfactual analysis

**Topic III:** Tools and Techniques
- Monte Carlo simulation
- Discrete event simulation and queuing theory
- Constrained optimization
- Non-linear optimization

**Topic IV:** Loss Functions
- Demand (consumer) side:
  - Utility and compensating value
  - Purchase intention
  - Satisfaction
- Supply (firm) side:
  - Profit and cost allocation
  - Sales and market share
  - Trial and repeat

**Topic V:** Applications
- Accounting
- Finance
- Human Resources
- Marketing
- Production

Readings

Reading packet will be used
November 6, 2014

Dr. Patricia West, Associate Dean of Undergraduate Programs
Fisher College of Business
Fisher 544
2100 Neil Avenue
Columbus, OH 43210

Dear Dean West:

I am pleased to write this letter of concurrence in support of the newly proposed Minor in Business Analytics, in the Fisher College of Business.

This minor is an appropriate and valuable complement to the newly created interdisciplinary major in Data Analytics. It is designed to provide undergraduate students not majoring in Data Analytics – both from Fisher College and from other colleges on campus – with an opportunity to gain a measure of competence in the important emerging field of data analytics and to take advantage of some of the courses newly developed for the Data Analytics major. Many of the core courses in this Data Analytics Minor have Arts and Sciences (ASC) courses as required prerequisites. The proposed minor also includes a set of elective Statistics courses from ASC, all of which are absolutely appropriate.

I am happy to give the proposed minor my unqualified support.

Sincerely,

[Signature]

David Manderscheid
Executive Dean and Vice Provost
Hi Pat,

I am the Vice Chair for Administration and Undergraduate Studies for the Department of Statistics. Members of our Curriculum Committee and our Faculty Director of the Data Analytics major discussed your proposed Business Analytics Minor. We agree that the proposed minor would be a valuable addition for OSU students and are happy to provide our support for the proposed minor. Initially we anticipate being able to handle the additional students in Statistics 3201 and 3202. However, if the minor attracts 50 students a year, we are likely to require additional support for teaching.

Professor William Notz  
Vice Chair, Department of Statistics
Date: 30 October 2014

To: Patricia M. West, PhD  
   Associate Dean of Undergraduate Programs  
   Fisher College of Business

Subject: Business Analytics Minor Proposal

The proposed Business Analytics Minor has been discussed at a number of meetings of the Data Analytics Degree Oversight Committee during which representatives from the College of Engineering were present, specifically including the Department of Integrated Systems Engineering and the Department of Computer Science and Engineering. The College of Engineering believes that the Business Analytics Minor is well thought out and will be popular with many students. Consequently, the College of Engineering is pleased to support the proposed Business Analytics Minor.

Sincerely,

David L Tomasko  
Associate Dean for Undergraduate Education and Student Services
Letter of Support from CSE

From: <Soundarajan>, Neelam <neelam@cse.ohio-state.edu>
Date: Thursday, October 16, 2014 at 1:33 PM
To: Patricia West <west.284@osu.edu>
Cc: “Hans, Christopher” <hans@stat.osu.edu>, “Parthasarathy, Srinivasan” <srini@cse.ohio-state.edu>,
    “Supowit, Kenneth” <supowit.1@osu.edu>, “Soundarajan, Neelam” <neelam@cse.ohio-state.edu>
Subject: Business Analytics Minor

Hi Pat,

I am Associate Chair for the CSE Dept. Members of our Undergraduate Studies Comm. and Curriculum Comm. discussed your proposed Business Analytics Minor as well as the revised BUS 3XX1 and its overlap with our CSE 3241 (Introduction to Database Systems). We are satisfied that the overlap is minimal and are happy to provide concurrence for the course. We also agreed that the proposed minor would be a valuable addition for OSU students and are happy to provide our support for the proposed minor.

Best wishes,

--Neelam

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Neelam Soundarajan
Associate Chair
Computer Science & Engineering
Ohio State University

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