Principles of Business Analytics

SECTION I: Course Overview

Course Code: BUS305
Subject Area(s): Business Analytics
Prerequisites: Statistics
Language of Instruction: English
Total Contact Hours: 45
Recommended Credits: 3

COURSE DESCRIPTION

Businesses are increasingly turning to data analytics to assist in evaluating and improving the decision-making process, so the ability to analyze and use data to inform important decisions is a critical skill for today's business students. This course explores the fundamental concepts needed to understand the emerging role of business analytics in organizations, and it highlights best practices in communicating with analytics professionals to effectively use and interpret analytic models and results for making better business decisions. Emphasis is placed on concepts and the interpretation of results and applications, rather than on theory and calculations.

The course will cover the use of data, statistical and quantitative analysis, explanatory and predictive models (including regression, classification, and clustering techniques), and fact-based management to drive decisions and actions.

LEARNING OBJECTIVES

Upon successful completion of this course, you will be able to:

- Explain the role of business analytics in effective decision-making.
- Compare descriptive and predictive analytics and the business questions that can be answered with each approach.
- Apply appropriate descriptive analytical tools in the analysis of quantitative and qualitative data from a variety of business scenarios.

SECTION II: Instructor & Course Details

INSTRUCTOR DETAILS

Name:	TBA
Contact Information:	TBA
Term:	SEMESTER

ATTENDANCE POLICY

This class will meet twice weekly for 90 minutes each session. All students are expected to arrive on time and prepared for the day's class session. Class may meet for more sessions per week, to meet a total of 45 contact hours.

CEA enforces a mandatory attendance policy. You are therefore expected to attend all regularly scheduled class sessions, including any field trips, site visits, guest lectures, etc. that are assigned by the instructor. The table below shows the number of class sessions you may miss before receiving a grade penalty.

ALLOWED ABSENCES – SEMESTER		
Courses Meeting X day(s) Per Week	**Allowed Absence(s)**	**Automatic Failing Grade at Xth absence**
Courses meeting **2** day(s) per week	**1** Absence	**4th** Absence

For every additional absence beyond the allowed number, your final course grade will drop down to the subsequent letter grade (ex: A+ to A). As a student, you should understand that the grade penalties will apply if you are marked absent due to tardiness or leaving class early. In the table below, you will find the grade penalty associated with each excessive absence up to and including automatic course failure.

ATTENDANCE DOCKING PENALTIES				
Absence	**1st**	**2nd**	**3rd**	**4th**
Penalty	**No Penalty**	**0.5 Grade Docked**	**1 Grade Docked**	**Automatic Failure**
HIGHEST POSSIBLE GRADE AFTER ATTENDANCE PENALTIES				
Grade	**A+**	**A**	**A-**	**F**

CEA does not distinguish between excused and unexcused absences. As such, no documentation is required for missing class. Similarly, excessive absences, and the grade penalty associated with each, will not be excused even if you are able to provide documentation that shows the absence was beyond your control. You should therefore only miss class when truly needed as illness or other unavoidable factors may force you to miss a class session later on in the term.

GRADING & ASSESSMENT

The instructor will assess your progress towards the above-listed learning objectives by using the forms of assessment below. Each of these assessments is weighted and will count towards your final grade. The following section (Assessment Overview) will provide further details for each.

Class Participation	**10%**
Projects	**25%**
Assignments	**25%**
Mid Term Exam	**20%**
Final Exam	**20%**

The instructor will calculate your course grades using the CEA Grading Scale shown below. As a CEA student, you should understand that credit transfer decisions–including earned grades for courses taken abroad–are ultimately made by your home institution.

CEA GRADING SCALE			
Letter Grade	**Numerical Grade**	**Percentage Range**	**Quality Points**
A+	9.70 – 10.0	97.0 – 100%	4.00
A	9.40 – 9.69	94.0 – 96.9%	4.00
A-	9.00 – 9.39	90.0 – 93.9%	3.70
B+	8.70 – 8.99	87.0 – 89.9%	3.30
B	8.40 – 8.69	84.0 – 86.9%	3.00
B-	8.00 – 8.39	80.0 – 83.9%	2.70
C+	7.70 – 7.99	77.0 – 79.9%	2.30
C	7.40 – 7.69	74.0 – 76.9%	2.00
C-	7.00 – 7.39	70.0 – 73.9%	1.70
D	6.00 – 6.99	60.0 – 69.9%	1.00
F	0.00 – 5.99	0.00 – 59.9%	0.00
W	Withdrawal	N/A	0.00
INC	Incomplete	N/A	0.00

ASSESSMENT OVERVIEW

This section provides a brief description of each form of assessment listed above. Your course instructor will provide further details and instructions during class time.

Class Participation (10%): Student participation is mandatory for all courses taken at a CEA Study Center. The instructor will use the rubric below when determining your participation grade. All students should understand that attendance and punctuality are expected and will not count positively toward the participation grade.

CLASS PARTICIPATION GRADING RUBRIC	
Student Participation Level	**Grade**
	A+

You make major & original contributions that spark discussion, offering critical comments clearly based on readings, research, & theoretical course topics.	(10.0 – 9.70)
You make significant contributions that demonstrate insight as well as knowledge of required readings & independent research.	**A/A-** (9.69 – 9.00)
You participate voluntarily and make useful contributions that are usually based upon some reflection and familiarity with required readings.	**B+/B** (8.99 – 8.40)
You make voluntary but infrequent comments that generally reiterate the basic points of the required readings.	**B-/C+** (8.39 – 7.70)
You make limited comments only when prompted and do not initiate debate or show a clear awareness of the importance of the readings.	**C/C-** (7.69 – 7.00)
You very rarely make comments and resist engagement with the subject. You are not prepared for class and/or discussion of course readings.	**D** (6.99 – 6.00)
You make irrelevant and tangential comments disruptive to class discussion. You are consistently unprepared for class and/or discussion of the course readings.	**F** (5.99 – 0.00)

Virtual class participation will be measured by (a) how often students log in the course, (b) their performance and attitude in mandatory live sessions, and (c) how significant their contributions to the virtual discussions are; students should be ready to offer critical comments clearly based on readings, research, & theoretical course topics.

Projects (25%): during the course there will be 5 projects to do in class and finish them at home if necessary.

Assignments (25%): Assignments will be given throughout the duration of the course. Assignments will involve solving problems on specific topics covered during the course and will build the skills needed for the midterm and final exam. All assignments must be successfully completed by the end of the term.

Midterm Exam (20%): The midterm will evaluate progress made towards meeting the course learning objectives.

Final Exam (20%): A comprehensive final exam will be administered at the conclusion of the term.

EXPERIENTIAL LEARNING ACTIVITIES

CEA courses are designed to include a variety of experiential learning activities that will take you out of the classroom and allow you to explore your local, host city. These activities may include field studies, guest lectures and/or activities offered through our Academically Integrated Cultural Activities Program (AICAP). The following experiential learning activities are recommended for this course:

- Guest lecture on applied business analytics. The speaker will explain how business analytics techniques are used in their organization by highlighting business use cases they have developed.

- Insider's Tour: A visit to a local company to learn how business analytics teams are organized and the methodologies with which they work on projects.

SOFTWARE REQUIREMENTS

A no-code Machine Learning platform or other data analytics platforms may be used to enhance the learning experience. These might be software you will need to download or could be cloud based. These platforms will be announced during the course.

REQUIRED READINGS

Reading assignments for this course will come from the required text(s) and/or the selected reading(s) listed below. All required readings–whether assigned from the text or assigned as a selected reading–must be completed according to the due date assigned by the course instructor.

I.   **REQUIRED TEXT(S)**: You may purchase or obtain the required text(s) prior to departure or upon program arrival. The required text(s) are listed below:

Evans, James R. (2020). Business Analytics, 3rd edition; 704 pp.

Provost, Foster, Fawcett, Tom (2013). Data Science for Business: What You Need to Know About Data Mining and Data-Analytic Thinking, 1st edition. 386 pp.

ADDITIONAL RESOURCES

In order to ensure your success abroad, CEA has provided the academic resources listed below. In addition to these resources, each CEA Study Center provides students with a physical library and study areas for group work. The Academic Affairs Office at each CEA Study Center also compiles a bank of detailed information regarding libraries, documentation centers, research institutes, and archival materials located in the host city.

- **UNH Online Library**: As a CEA student, you will be given access to the online library of CEA's School of Record, the University of New Haven (UNH). You can use this online library to access databases and additional resources while performing research abroad. You may access the UNH online library here or through your MyCEA Account. You must comply with UNH Policies regarding library usage.
- **CEAClassroom – Moodle**: CEA instructors use Moodle, an interactive virtual learning environment. This web-based platform provides you with constant and direct access to the course syllabus, daily schedule of class lectures and assignments, non-textbook required readings, and additional resources. Moodle includes the normal array of forums, up-loadable and downloadable databases, wikis, and related academic support designed for helping you achieve the learning objectives listed in this syllabus.

  During the first week of class, CEA academic staff and/or faculty will help you navigate through the many functions and resources Moodle provides. While you may print a hard copy version of the syllabus, you should always check Moodle for the most up-to-date information regarding this course. The instructor will use Moodle to make announcements and updates to the course and/or syllabus. It is your responsibility to ensure that you have access to all Moodle materials and that you monitor Moodle on a daily basis in case there are any changes made to course assignments or scheduling. To access Moodle: Please log-in to your MyCEA account using your normal username and password. Click on the "While You're Abroad Tab" and make sure you are under the "Academics" sub-menu. There you will see a link above your schedule that says "View Online Courses" select this link to be taken to your Moodle environment.

COURSE CALENDAR Introduction to Business Analytics			
SESSION	**TOPICS**	**ACTIVITY**	**READINGS & ASSIGNMENTS**
1	**Course Introduction:** Review Syllabus, Classroom Policies **Introduction to Business Analytics**	Course Overview Learn about Digital Transformation. Understanding different concepts: Business Analytics, Data Analytics, Data Science, AI, Machine Learning, Deep Learning, Data mining, Big Data. From traditional analytics to predictive analytics.	**Reading:** Business Analytics chapter 1. Data Science for Business chapter 1.
2	**Exploratory Data Analysis – Descriptive Statistics:** Introduction, Source, Population, Sample Data types	Understanding the importance of the source of the data, the difference between population and sample, and the different data types: qualitative and quantitative variables. How do we transform from a quantitative to a qualitative variable and vice versa?	**Reading:** Business Analytics chapter 4. **Assignments:** Look at the data you were given, and define the data types for the variables, and explain if you would transform some from quantitative to qualitative or vice versa and why.
3	**Exploratory Data Analysis – Descriptive Statistics:** Numerical and graphical techniques	Learn to analyze categorical and numerical variables: frequency tables, distribution measures: centrality and dispersion. Do visual representations of the data according to its type.	**Reading:** Business Analytics chapter 4. **Assignments:** Use these techniques to draw some conclusions from the dataset given.
4	**Exploratory Data Analysis – Descriptive Statistics:** Relationship between variables	Learning to analyze relationships between variables: between continuous variables, between categorical variables, and between continuous and categorical variables	**Reading:** Business Analytics chapter 4. **Assignments:** Use these techniques to draw some conclusions from the dataset given.

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5	**Statistics Project**	Work on an activity to understand all the concepts related to descriptive and inferential analysis.	**Assignments:** Finish your project.
6	**Exploratory Data Analysis – Descriptive Statistics:** Outliers **Introduction to Probability** How is probability used in Data Analysis, basic definitions, what is probability, conditional probability, independence of events	Understanding what outliers are and their impact in data analysis. Using Probability to Make Decisions - an introduction to probability.	**Reading:** Business Analytics chapter 5. **Assignments:** Look at the data given and explain if there are outliers and how they may impact your analysis.
7	**Introduction to Probability** Probability distributions: discrete and continuous	Using Probability to Make Decisions - an introduction to probability. Discrete & continuous probability	**Reading:** Business Analytics chapter 5.
8	**Introduction to Inferential Statistics** Sampling distribution, Hypothesis testing	Understanding the difference between descriptive and inferential analysis. Learning basic concepts of hypothesis testing and applications.	**Reading:** Business Analytics chapter 6 & 7. **Assignments:** Research: look what AB Testing is and explain how it is applied in some business cases.
9	**Probability Project**	Work on an activity to understand all the concepts related to introduction to probability.	**Assignments:** Finish your project.
10	**Introduction to Machine Learning and predictive analytics** Supervised and unsupervised algorithms. Models and algorithms. Workflow.	Learn the differences between supervised and unsupervised models, and between algorithms and models. Understand the workflow and lifecycle of an analytics project.	**Reading:** Data Science for Business chapter 2. **Assignments:** Research: bring real life business cases that you would solve with supervised and unsupervised models.

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11	**Machine Learning Key Concepts** Classification vs regression. Parametric vs nonparametric models. Bias variance tradeoff. Cost function.	Learn the basics of Machine Learning, including difference between classification and regression problems, parametric and nonparametric models. Understand the impact of overfitting and underfitting models. Understand how metrics or results can be affected if no proper splitting techniques are applied to data.	**Reading:** Complementary reading: Business Analytics chapter 10. Data Science for Business chapter 5. **Assignments:** Research: bring real life business cases that you would solve with classification and regression models.
12	**Machine Learning Key Concepts** In-sample and out-of-sample predictions. Imbalance of classes	In this session, we discuss the notion of in-sample and out-of-sample (or holdout data) predictions, and how the latter is key to properly assess the quality of predictions. How does data imbalance impact our metrics? Applying different methods to mitigate class imbalance.	**Reading:** Data Science for Business pp.113-115, pp.126-130. **Assignments:** Research: bring real life business cases where there might be class imbalance.
13	**Linear Regression**	Learn what Linear Regression is, when to use it, and how it works. Interpreting Linear Regression coefficients.	**Reading:** Business Analytics chapter 8. **Assignments:** Linear Regression Exercise
14	**Linear Regression**	Evaluating regression models. Understanding the underlying problems with Linear Regression.	**Reading:** Business Analytics chapter 8. **Assignments:** Linear Regression Exercise
15	**MIDTERM EXAM**		

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16	**Linear and Polynomic Regression**	How do we do linear regression with more variables? Multivariate Analysis in a multiple linear regression. Applying transformations to variables to catch nonlinear relationships in our data.	**Reading:** Business Analytics chapter 8. **Assignments:** Polynomic Regression Exercise
17	**Evaluating Classification Models**	In this session, we discuss how to assess the quality of predictions and quantify the errors one may make when predicting 0/1 outcomes. In particular, we introduce the notion of Confusion Matrix with its metrics and ROC curves and detail how to account for such errors when making economic or other trade-offs.	**Reading:** Business Analytics chapter 10. Data Science for Business pp. 188-193, pp. 114-219. **Assignments:** selecting metrics for different business cases.
18	**Business Cases Project**	Understand how business apply predictive analytics through different company examples.	**Finish your project.**
19	**KNN** Regression and classification KNN	Understanding how KNN works and when to use it in predictive analytics.	**Reading:** Business Analytics chapter 10. Data Science for Business pp. 142-163. **Reading:** Research: bring a business case where a company applied KNN model.
20	**Trees** Regression and classification trees	Learn how trees work and how to use them in classification and regression tasks.	**Reading:** Business Analytics chapter 16. Data Science for Business pp.48-79. **Assignments:** Research: bring a business case where a company applied trees models.

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21	**Trees** Regression and classification trees	How to get feature importance with trees, and how this impacts business analysis. Why are usually trees considered weak models? What's the solution?	**Reading:** Business Analytics chapter 16. Data Science for Business pp.48-79. **Assignments:** Research: bring a business case where a company applied ensembles of trees models.
22	**Machine Learning Project**	Hands-on activity to apply predictive analytics in real life business situations.	Finish your project.
23	**Logistic Regression and SVM**	Understanding other classifications techniques such as logistic regression or Support Vector Machine (SVM). When to use them and what are their weaknesses and advantages?	**Reading:** Business Analytics chapter 10. Data Science for Business pp. 96-108. **Assignments:** Research: bring a business case where a company applied logistic regression.
24	**KMeans Clustering**	How would you apply customer segmentation? Or how does Netflix suggest you to watch a movie/series, or Amazon to buy a product? Understanding how clustering works, and a bit more on the most basic clustering model: KMeans.	**Reading:** Business Analytics chapter 10. Data Science for Business pp. 163-184. **Assignments:** Research: bring a business case where a company applied clustering.
25	**Clustering Project**	Hands-on activity to apply clustering in real life business situations.	Finish your project.
26	**FINAL EXAM**		

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SECTION III: CEA Academic Policies

The policies listed in this section outline general expectations for CEA students. You should carefully review these policies to ensure success in your courses and during your time abroad. Furthermore, as a participant in the CEA program, you are expected to review and understand all CEA Student Policies, including the academic policies outlined on our website. CEA reserves the right to change, update, revise, or amend existing policies and/or procedures at any time. For the most up to date policies, please review the policies on our website.

> Class & Instructor Policies can be found here
> General Academic Policies can be found here