

## MANDATORY CLASSES

### ***Applied Statistics***

The aim of the course is to give the fundamentals of statistical analysis. This course introduces the basics of statistics for engineers to summarize numerical and categorical data obtained from surveys, experiments, etc. The topics include different data types, measures of location, variability, shape, and association between variables. The students are expected to learn the fundamental concepts of estimation, confidence intervals, hypothesis testing and apply appropriate tests for population mean, proportion, variance and difference, independence, and goodness to fit.

### ***Data Analytics Essentials***

The aim of the course is to give the fundamentals of exploratory data analytics. At the end of the course, the students will be able understand data analysis via exploratory data analysis as a journey, explore data at multiple levels using appropriate visualizations, acquire statistical knowledge for summarizing data, demonstrate curiosity and skepticism when performing data analysis and develop intuition around a data set and understand how the data was generated.

### ***Big Data Management***

In this course, the students will examine how to query on RDBMS and Big data ecosystems products, design modern edition data warehouses and manage massively parallel processing data warehouse technologies on cloud platforms. They will look at the existing technologies such as RDBMS systems, Hadoop ecosystem products (Hive, Spark etc.) and MPP products (Azure SQL DW, AWS Redshift etc.) and investigate their uses.

### ***Intro to Programming for Big Data (Python)***

In this introduction to computer programming course, the students will learn and practice key computer science concepts with hands-on applications. The course will feature Python, a powerful, easy-to-learn, and widely used programming language, and computer science basics such as algorithm development using iterative refinement, structural design, I/O processes and sequential processes will be explored.

### ***Introduction to Machine Learning***

This course will provide insight into the basics of using machine learning algorithms to quantify operational implications of the Big Data Analytics. The course content will introduce the main principles and methods of machine learning including Naïve Bayes, Support Vector Machines (SVM), Decision Trees, Neural Networks and others. This course aims to provide the theoretical and practical dimensions for the machine learning algorithms applied to real-world problems especially related to Big Data.

### ***Optimization and Simulation***

The aim of the course is to help the students create optimization and simulation models, and analyze these models to provide insight regarding the assumptions, value drivers, and risks present in a business situation. The students will use the models to explore different ways to think about uncertainty, guide decision-making, and persuasively communicate analytical results.

### ***End-To-End Big Data Analytics***

This course is designed to be a complement of the Capstone Project class. Over the duration of this course, the students will focus on one specific business problem and see it from start to completion. From setting up the proper database environment to store the relevant data to the creation of the pipeline for implementation of the proposed analytical solution will be examined. Upon completion of this course, the students will have a bird's eye perspective of the process of creation and deployment of a practical analytical solution.

## **ELECTIVE CLASSES**

### ***Data Visualization***

This course will cover how to apply design principles, human perception, color theory, and effective storytelling to data visualization. The students will survey existing approaches and also will analyze the factors which contribute to success or lack of success of the implementations.

### ***Marketing Analytics***

The aim of the course is to give the basic understanding of analytics problems in marketing. Statistical methods, models, and cases will be employed to illustrate approaches to marketing intelligence problems, such as forecasting, price sensitivity and campaign management.

### ***Web Analytics***

This course will provide insight into the basics of analytics and optimization to explore of user experience and focuses on understanding customers' behavior by using data gathering from websites or mobile applications. Also, the course contains optimizing end-customer behavior by using testing/optimization tools or investigate the bottlenecks of customers when using websites or mobile applications.

### ***Big Data Applications in Finance***

This course will provide insight into the essentials of financial analysis and management using financial data. The student will learn obtaining and reading financial datasets and preparing them for big data analysis and cover various topics on investment and risk management models used by corporations, commercial and investment banks, hedge funds, securities and brokerage firms.

### ***Model Building and Validation***

This course will teach the students how to start from scratch in answering questions about the real world using data. The model building process involves setting up ways of collecting data, understanding and paying attention to what is important in the data to answer relevant business questions, finding a statistical, mathematical or a simulation model to gain understanding and make predictions. This process involves asking questions, gathering and manipulating data, building models, and ultimately testing and evaluating them.

### ***Case Studies in Analytics***

This course examines various case studies arising from different application areas. With the aid of experienced academicians and practitioners, each week the students will go through the main steps of tackling analytics problems. With each case study, the data manipulation tools shall be revisited. Attention will be given to feature reduction and model selection. Each case study will be completed by a complete analysis and interpretation of the results.