Data Analytics and Predictive Modeling Student Learning Outcomes

Knowledge		Student Learning Outcomes
K-1	Knowledge of risk management processes (e.g., methods for assessing and mitigating risk).	Explain information security fundamentals. Demonstrate an understanding of the importance of ethics and privacy with data. Describe the functions of database recovery, security and administration, and basic data warehousing concepts.
K-16	Knowledge of data classification standards and methodologies based on sensitivity and other risk factors.	
K-17	Knowledge of Personally Identifiable Information (PII) data security standards.	
K-30	Knowledge of how to identify and document potential ethical concerns for application of model outputs.	
K-4	Knowledge of data administration and data standardization policies.	Describe the principles, techniques, and business policies for collecting, organizing, managing, analyzing, and reporting information. Describe the process of data science analytics from data acquisition to recommendations based on data. Describe different methods and tools for data collection and their impact on analysis of data. Identify the concepts of the relational model, normalization, dependencies, integrity, and constraints.
K-11	Knowledge of the with various technologies for organizing and managing information (e.g., databases, bookmarking engines).	
K-18	Knowledge of the principal methods, procedures, and techniques of gathering information and producing, reporting, and sharing information.	
K-5	Knowledge of data mining and data management principles.	
K-19	Knowledge of data mining techniques.	
K-26	Knowledge of Decision Science Game theory.	
K-28	knowledge of optimization.	
K-29	Knowledge of data analysis concepts.	
K-2	Knowledge of computer algorithms.	Apply the basics of programming principles. Demonstrate problem solving skills by developing and implementing algorithms to solve problems. Explain and apply the basic concepts of simulation-based methods.
K-3	Knowledge of computer programming principles.	
K-8	Knowledge of programming language structures and logic.	
K-12	Knowledge of command-line tools (e.g., mkdir, mv, ls, passwd, grep).	
K-13	Knowledge of interpreted and compiled computer languages.	
K-27	Knowledge of the use of simulation.	
K-6	Knowledge of database management systems, query languages, table relationships, and views.	Identify different database systems.
K-9	Knowledge of query languages such as SQL (structured query language).	
K-7	Knowledge of mathematics (e.g., logarithms, trigonometry, linear algebra, calculus, statistics, and operational analysis).	Select appropriate mathematical and statistical tools used for data analytics.
K-24	Knowledge of advanced statistical techniques and concepts (regression, properties of distributions, statistical tests and proper usage, etc.) and experience with applications.	
K-10	Knowledge of sources, characteristics, and uses of the organization’s data assets.	Describe the data acquisition process. Explain data warehousing architectures, processes, and operations.
K-21	Knowledge of how to extract, analyze, and use metadata.	
K-14	Knowledge of how to utilize Hadoop, Java, Python, SQL, Hive, and Pig to explore data.	Describe tools and techniques to store and process data.
K-22	Knowledge on ETL techniques, Hadoop, Data analytics, Big data is an advantage.	
K-15	Knowledge of machine learning theory and principles.	Explain machine learning principles and techniques.
K-23	Knowledge of a variety of machine learning techniques (clustering, decision tree learning, artificial neural networks, etc.) and their real-world advantages/drawbacks.	
K-20	Knowledge of database theory.	Discuss database tools and techniques.
K-25	Knowledge of the underlying theory and concepts of Relational Databases (e.g., Microsoft SQL Server, Oracle, Teradata MySQL).	
Skills		**Student Learning Outcomes**
S-1	Skill in conducting queries and developing algorithms to analyze data structures.	Perform queries and develop reports.
S-6	Skill in generating queries and reports.	
S-3	Skill in data mining techniques (e.g., searching file systems) and analysis.	Create data models and use data mining techniques, models and tools. Cleanse and prepare data for analysis.
S-4	Skill in using and contributing content to data dictionaries.	
S-5	Skill in developing data models.	
S-15	Skill in using data mapping tools.	
S-16	Skill in using outlier identification and removal techniques.	
S-8	Skill in data pre-processing (e.g., imputation, dimensionality reduction, normalization, transformation, extraction, filtering, smoothing).	
S-9	Skill in identifying patterns or relationships.	Develop or discover analytical patterns from data models.
S-10	Skill in performing sentiment analysis.	

S-11	Skill in Regression Analysis (e.g., Hierarchical Stepwise, Generalized Linear Model, Ordinary Least Squares, Tree-Based Methods, Logistic).	Design and develop analytical solutions using appropriate mathematical and statistical models and tools. Apply data analytic tools to data in order to predict outcomes and classify data. Develop a software statistical modeling project and present the solution.
S-12	Skill in supporting transformation analytics to invoke a business shift.	
S-13	Skill in using basic descriptive statistics and techniques (e.g., normality, model distribution, scatter plots).	
S-26	Skill in performing data analysis including applying statistics.	
S-2	Skill in creating and utilizing mathematical or statistical models.	
S-31	Skill in analytics problem framing (e.g., define geometric sets).	
S-23	Skill in tailoring analysis to the necessary levels (e.g., classification and organizational).	
S-14	Skill in using data analysis tools (e.g., Excel, Python).	Demonstrate coding and scripting techniques using data analytics programming languages. Use appropriate programming language, data structures, and concepts to solve data science problems. Build arrays, data frames, dictionaries and perform basic calculations using programming languages. Develop a software statistical modeling project and present the solution. Use data visualization tools to analyze data and produce reports.
S-7	Skill in writing code in a currently supported programming language (e.g., Python).	
S-17	Skill in writing scripts using R, Python, PIG, HIVE, SQL, etc.	
S-27	Skill in using statistical computer languages (R, Python, etc.) to manipulate data and draw insights from large data sets.	
S-28	Skill in Visualization using R, Python, or other languages and frameworks.	
S-18	Skill to identify sources, characteristics, and uses of the organization's data assets.	Identify and interpret the data relevance, reliability, and validity from multiple sources. Describe the business intelligence methodology and concepts and relate them to decision support.
S-24	Skill in using multiple search engines (e.g., Google, Yahoo, LexisNexis, DataStar) and tools in conducting open-source searches.	
S-19	Skill in conducting information searches.	
S-20	Skill in developing or recommending analytic approaches or solutions to problems and situations for which information is incomplete or for which no precedent exists.	
S-21	Skill in evaluating information for reliability, validity, and relevance.	
S-25	Skill in utilizing feedback to improve processes, products, and services.	Demonstrate effective collaboration and communication skills to improve team productivity. Derive problem specifications from problem statements.
S-29	Skill in problem-solving skills and critical thinking ability.	
S-30	Skill in collaboration and communication skills within and across teams.	
S-22	Skill in preparing and presenting briefings.	
Abilities		**Student Learning Outcomes**
A-1	Ability to dissect a problem and examine the interrelationships between data that may appear unrelated.	Proficient in solving business problems by identifying data gaps and synthesizing data to deliver quality output. Utilize SQL and QBE commands to define, query and manipulate a relational database. Apply databases to actual situations and business problems.
A-4	Ability to source data used in information, assessment, and/or planning products.	
A-7	Ability to evaluate, analyze, and synthesize large quantities of data (which may be fragmented and contradictory) into quality, fused targeting/information products.	
A-23	Ability to understand and use the databases and tools to run queries to solve the business problem.	
A-15	Ability to identify information gaps.	
A-22	Ability to understand a business problem.	
A-24	Ability to identify patterns.	
A-17	Ability to recognize and mitigate deception in reporting and analysis.	
A-20	Ability to utilize multiple information sources across all information disciplines.	
A-2	Ability to identify basic common coding flaws at a high level.	Proficient in effectively using data analytics programming and visualization tools. Use data visualization tools to analyze data and produce reports. Complete the steps to design and implement a dashboard.
A-3	Ability to use data visualization tools (e.g., Flare, HighCharts, AmCharts, D3.js, Processing, Google Visualization API, Tableau, Raphael.js).	
A-5	Ability to communicate complex information, concepts, or ideas in a confident and well-organized manner through verbal, written, and/or visual means.	Competent in effective collaboration, communication and listening skills to define and solve business problem to a diverse audience. Develop algorithms using modular design principles to meet stated specifications. Identify, evaluate and suggest solutions to problems encountered in a team communication context.
A-9	Ability to effectively collaborate via virtual teams.	
A-13	Ability to adapt to a dynamic environment.	
A-14	Ability to function in a collaborative environment, seeking continuous consultation with other analysts and experts—both internal and external to the organization—to leverage analytical and technical expertise.	
A-21	Ability to effectively communicate ideas to team members with varying levels of technical expertise.	
A-18	Ability to think critically.	
A-16	Ability to recognize and mitigate cognitive biases which may affect analysis.	Maintain high standards of professional competence, conduct, and ethical practice.
A-11	Ability to exercise strong ethical judgment when policies are not well-defined.	

A-8	Ability to clearly articulate information requirements into well-formulated research questions and data tracking variables for inquiry tracking purposes.	Competent to identify and evaluate data relevance, reliability and validity from multiple sources to meet customer's needs. Research and utilize validated data to logically construct a report based on customer's needs.
A-12	Ability to focus research efforts to meet the customer’s decision-making needs.	
A-6	Ability to develop or recommend analytic approaches or solutions to problems and situations for which information is incomplete or for which no precedent exists.	
A-10	Ability to evaluate information for reliability, validity, and relevance.	
A-19	Ability to understand objectives and effects.	