### Data Analytics and Predictive Modeling Student Learning Outcomes

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

Ability to understand a business problem.

Skill in creating and utilizing mathematical or statistical models.

Skill in using data analysis tools (e.g., Excel, Python).

Skill in preparing and presenting briefings.

Skill in collaboration and communication skills within and across teams.

Skill in utilizing feedback to improve processes, products, and services.

Skill in evaluating information for reliability, validity, and relevance.

Skill in performing data analysis including applying statistics.

Skill in analytics problem framing (e.g., define geometric sets).

Skill in tailoring analysis to the necessary levels (e.g., classification and organizational).

Skill in using data analysis tools (e.g., Excel, Python).

Skill in writing code in a currently supported programming language (e.g., Python).

Skill in writing scripts using R, Python, PIG, HIVE, SQL, etc.

Skill in using statistical computer languages (R, Python, etc.) to manipulate data and draw insights from large data sets.

Skill in Visualization using R, Python, or other languages and frameworks.

Skill in identifying sources, characteristics, and uses of the organization’s data assets.

Skill in using multiple search engines (e.g., Google, Yahoo, LexisNexis, DataStar) and tools in conducting open-source searches.

Skill in conducting information searches.

Skill in developing or recommending analytic approaches or solutions to problems and situations for which information is incomplete or for which no precedent exists.

Skill in evaluating information for reliability, validity, and relevance.

Skill in utilizing feedback to improve processes, products, and services.

Skill in problem-solving skills and critical thinking ability.

Skill in collaboration and communication skills within and across teams.

Skill in preparing and presenting briefings.

Skill in Regression Analysis (e.g., Hierarchical Stepwise, Generalized Linear Model, Ordinary Least Squares, Tree-Based Methods, Logistic).

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<th>Ability to clearly articulate information requirements into well-formulated research questions and data tracking variables for inquiry tracking purposes.</th>
<th>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.</th>
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<tr>
<td>A-8</td>
<td>Ability to focus research efforts to meet the customer's decision-making needs.</td>
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<td>A-6</td>
<td>Ability to develop or recommend analytic approaches or solutions to problems and situations for which information is incomplete or for which no precedent exists.</td>
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<td>A-10</td>
<td>Ability to evaluate information for reliability, validity, and relevance.</td>
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<tr>
<td>A-19</td>
<td>Ability to understand objectives and effects.</td>
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