

## Data Management and Engineering Student Learning Outcomes

Knowledge		Student Learning Outcomes
K-36	Knowledge of database access application programming interfaces (e.g., Java Database Connectivity [JDBC]).	Describe how to access and connect different databases using application programming interfaces (API) and scripting languages.
K-51	Knowledge of scripting languages.	
K-33	Knowledge of how IT supports the organization's core business/mission processes.	Discuss how IT supports the organization's core business processes.
K-44	Knowledge of the principal methods, procedures, and techniques of gathering information and producing, reporting, and sharing information.	Identify methods, procedures and techniques of gathering and sharing information.
K-34	Knowledge of Cloud-based knowledge management technologies and concepts related to security, governance, procurement, and administration.	Explain different technologies and concepts as they relate to security, governance, procurement and administration in a cloud-based environment.
K-3	Knowledge of laws, regulations, policies, and ethics as they relate to cybersecurity and privacy.	Describe laws, regulations and ethical behavior related to cybersecurity and privacy.
K-14	Knowledge of cybersecurity and privacy principles.	
K-6	Knowledge of ethics.	
K-15	Knowledge of cyber threats and vulnerabilities.	Identify how to assess cyber threats and vulnerabilities.
K-16	Knowledge of specific operational impacts of cybersecurity lapses.	Describe the operational implications to the organization of cybersecurity lapses.
K-17	Knowledge of cyber defense and vulnerability assessment tools and their capabilities.	Identify capabilities of cyber defense and vulnerabilities tools.
K-37	Knowledge of Personally Identifiable Information (PII) data security standards.	Explain data security standards such as PII, PCI and PHI.
K-38	Knowledge of Payment Card Industry (PCI) data security standards.	
K-39	Knowledge of Personal Health Information (PHI) data security standards.	
K-7	Knowledge of data architecture frameworks such as Zachman Framework for Enterprise Architecture.	Describe different data architecture frameworks and protocols for data governance.
K-23	Knowledge of recent streaming data frameworks and protocols AMQP, (e.g. Kafka, RabbitMQ).	
K-31	Knowledge of the capabilities and functionality of various collaborative technologies (e.g., groupware, SharePoint).	Compare and contrast capabilities and functionality of different collaborative technologies.
K-42	Knowledge of use cases related to collaboration and content synchronization across platforms (e.g., Mobile, PC, Cloud).	Discuss collaboration and content synchronization use cases across hardware platforms.
K-46	Knowledge of database theory.	Explain relevant database theories.
K-19	Knowledge of data backup and recovery.	Identify the data backup and recovery processes.
K-4	Knowledge of Data Governance topics and their relationship to Information Governance, IT Governance, IT Service Management, Business Management PMO, Business Operations, and Risk Management.	Discuss the role of data governance and it's relationship to an organization's business operations.
K-5	Knowledge of Overall Data Management Maturity Model.	Explain how an organization's Data Management Maturity Model (DMMM) helps benchmark organizational performance.
K-18	Knowledge of data administration and data standardization policies.	Discuss data administration and standardization policies.
K-22	Knowledge of digital rights management.	List and describe the organization's data assets and digital rights management.
K-28	Knowledge of sources, characteristics, and uses of the organization's data assets.	
K-48	Knowledge of understanding data ownership and data stakeholders.	Differentiate between data owner and data stakeholder.
K-47	Knowledge of maintaining databases (i.e., backup, restore, delete data, transaction log files, etc.).	Maintain databases by updating, adding, deleting and appending records as necessary for business operations.
K-49	Knowledge of database maintenance.	
K-50	Knowledge of replication services.	Describe the process of data replication services.
K-8	Knowledge of Data Modeling Techniques.	State and describe different data modeling methodologies and capabilities for organizing and managing information.
K-30	Knowledge of the capabilities and functionality associated with various technologies for organizing and managing information (e.g., databases, bookmarking engines).	
K-9	Knowledge of conceptual/logical modeling.	
K-10	Knowledge of physical modeling.	Compare and contrast the conceptual, logical and physical data models and document its use in a data governance tool.
K-11	Knowledge of how to document the model and its use as a data governance tool.	
K-45	Knowledge of data mining techniques.	Explain data mining and data warehousing principles and techniques.
K-20	Knowledge of data mining and data warehousing principles.	
K-35	Knowledge of data classification standards and methodologies based on sensitivity and other risk factors.	Explain different data classification standards and methodologies based on sensitivity and risk factors.
K-41	Knowledge of current and emerging data remediation security features in databases.	Identify current and emerging database security features.
K-43	Knowledge of an organization's information classification program and procedures for information compromise.	Explain the organization's IT security and privacy policies and procedures for data governance.

K-12	Knowledge of Data Storage and Operations.	Explain data storage operations including physical and virtual data storage media.
K-32	Knowledge of the characteristics of physical and virtual data storage media.	
K-29	Knowledge of the capabilities and functionality associated with content creation technologies (e.g., wikis, social networking, content management systems, blogs).	Describe the capabilities and functionality associated with content creation technologies.
K-40	Knowledge of current and emerging data encryption (e.g., Column and Tablespace Encryption, file and disk encryption) security features in databases (e.g., built-in cryptographic key management features).	Identify and describe various current information technologies and emerging database security principles and methods.
K-1	Knowledge of computer networking concepts and protocols, and network security methodologies.	Identify security methodologies using different networking environments and protocols.
K-24	Knowledge of network access, identity, and access management (e.g., public key infrastructure, OAuth, OpenID, SAML, SPML).	Explain the importance of network identity and access management policies and risk controls.
K-26	Knowledge of policy-based and risk adaptive access controls.	
K-25	Knowledge of operating systems (Linux, UNIX, Windows).	Explain the usage of different operating systems.
K-21	Knowledge of database management systems, query languages, table relationships, and views.	Describe the use and function of database management systems, query languages, table relationships, and views.
K-27	Knowledge of query languages such as SQL (structured query language).	
K-2	Knowledge of risk management processes (e.g., methods for assessing and mitigating risk).	Outline information security principles and processes.
K-13	Knowledge of data integration and interoperability for both structured and unstructured data.	Explain the process of integrating and interoperability of structured and unstructured databases.
<b>Skills</b>		<b>Student Learning Outcomes</b>
S-4	Skill in conducting queries and developing algorithms to analyze data structures.	Perform queries and develop reports to analyze data.
S-5	Skill in generating queries and reports.	
S-10	Skill in judgment and ethical decision making: Thinking about the pros and cons of different options and picking the best one.	Use and justify proper judgement while using pros and cons of different options when making an ethical decision.
S-6	Skill in maintaining databases (i.e., backup, restore, delete data, transaction log files, etc.).	Operate databases by updating, adding, deleting and appending records as necessary for business operations.
S-3	Skill in conducting knowledge mapping (e.g., map of knowledge repositories).	Build and sketch a knowledge management map of an organization's knowledge repositories.
S-8	Skill in using knowledge management technologies.	
S-13	Skill in consistency when modeling data (attention to data details).	Apply consistency when designing data modeling.
S-1	Skill in allocating storage capacity in the design of data management systems.	Employ data storage capacity when designing data management systems.
S-14	Skill in using various operating systems (e.g., Linux, UNIX, Windows).	Demonstrate the use of appropriate operating systems to solve a problem.
S-11	Skill in systems evaluation: Measuring how well a system is working and how to improve it.	Create and maintain an effective system performance baseline measure to identify and improve system performance.
S-7	Skill in optimizing database performance.	
S-9	Skill in problem solving from an entry-level viewpoint: Noticing a problem and figuring out the best way to solve it. Includes investigation and evaluation of new technology against core business processes and mission.	Apply troubleshooting skills by investigating and evaluating new technologies to solve a problem.
S-12	Skill in programming: Writing computer programs, including scripting.	Write code to access, connect and retrieve data from different databases using application programming interfaces(API) and scripting languages.
S-15	Skill in API design to retrieve data including languages such as REST, GraphQL, and capabilities such as Power BI and Tableau.	
S-2	Skill in conducting information searches.	Conduct information searches as necessary to solve a problem.
<b>Abilities</b>		<b>Student Learning Outcomes</b>
A-1	Ability to match the appropriate knowledge repository technology for a given application or environment.	Choose appropriate knowledge repository technology for a given environment.
A-2	Ability to order and arrange information.	Evaluate and assemble information in proper order.
A-3	Ability to demonstrate self-driven inquisitive data discovery.	Independently seeks and discovers relevant data.
A-4	Ability to see systems holistically (data systems rarely exist in a silo).	Construct a holistic view of data systems.