

Career & Technical Education | Information Technology

Database Administration

Subject Code: 145080

Outcome & Competency Descriptions

Course Description

Students will learn about user rights and responsibilities, concurrency security, reliability, backup/ and recovery to perform tasks involved in the administration and management of a database system. Students will design, extract, and transform data ensuring data quality. Knowledge and skills relating to reporting systems, data warehouses, and data mining will be developed.

Strand 1. Business Operations / 21st Century Skills

Learners apply principles of economics, business management, marketing and employability in an entrepreneur, manager, and employee role to the leadership, planning, developing, and analyzing of business enterprises related to the career field.

Outcome: 1.2. Leadership and Communications

Process, maintain, evaluate, and disseminate information in a business.
Develop leadership and team building to promote collaboration.

Competencies

- 1.2.5. Communicate information (e.g., directions, ideas, vision, workplace expectations) for an intended audience and purpose.
- 1.2.6. Use proper grammar and expression in all aspects of communication.
- 1.2.7. Use problem-solving and consensus-building techniques to draw conclusions and determine next steps.
- 1.2.11. Write professional correspondence, documents, job applications, and resumés.
- 1.2.12. Use technical writing skills to complete forms and create reports.
- 1.2.14. Use motivational strategies to accomplish goals.

Outcome: 1.3. Business Ethics and Law

Analyze how professional, ethical, and legal behavior contributes to continuous improvement in organizational performance and regulatory compliance.

Competencies

- 1.3.1. Analyze how regulatory compliance affects business operations and organizational performance.
- 1.3.2. Follow protocols and practices necessary to maintain a clean, safe, and healthy work environment.
- 1.3.4. Identify how federal and state consumer protection laws affect products and services.
- 1.3.5. Access and implement safety compliance measures (e.g., quality assurance information, safety data sheets [SDSs], product safety data sheets [PSDSs], United States Environmental Protection Agency [EPA], United States Occupational Safety and Health Administration [OSHA]) that contribute to the continuous improvement of the organization.
- 1.3.7. Identify the labor laws that affect employment and the consequences of noncompliance for both employee and employer (e.g., harassment, labor, employment, employment interview, testing, minor labor laws, Americans with Disabilities Act, Fair Labor Standards Acts, Equal Employment Opportunity Commission [EEOC]).
- 1.3.8. Verify compliance with computer and intellectual property laws and regulations.
- 1.3.9. Identify potential conflicts of interest (e.g., personal gain, project bidding) between personal, organizational and professional ethical standards.

Outcome: 1.4. Knowledge Management and Information Technology

Demonstrate current and emerging strategies and technologies used to collect, analyze, record, and share information in business operations.

Competencies

- 1.4.2. Select and use software applications to locate, record, analyze and present information (e.g., word processing, e-mail, spreadsheet, databases, presentation, Internet search engines).
- 1.4.3. Verify compliance with security rules, regulations and codes (e.g., property, privacy, access, accuracy issues, client and patient record confidentiality) pertaining to technology specific to the industry pathway.
- 1.4.4. Use system hardware to support software applications.
- 1.4.5. Use information technology tools to maintain, secure and monitor business records.
- 1.4.6. Use an electronic database to access and create business and technical information.

- 1.4.7. Use personal information management and productivity applications to optimize assigned tasks (e.g., lists, calendars, address books).

Outcome: 1.5. Global Environment

Evaluate how beliefs, values, attitudes and behaviors influence organizational strategies and goals.

Competencies

- 1.5.1. Describe how cultural understanding, cultural intelligence skills and continual awareness are interdependent.
- 1.5.6. Analyze work tasks for understanding and interpretation from a different cultural perspective.

Outcome: 1.7. Entrepreneurship / Entrepreneurs

Analyze the environment in which a business operates, and the economic factors and opportunities associated with self-employment.

Competencies

- 1.7.13. Protect intellectual property and knowledge (e.g., copyright, patent, trademark, trade secrets, processes).

Outcome: 1.8. Operations Management

Plan, organize and monitor an organization or department to maximize contribution to organizational goals and objectives.

Competencies

- 1.8.1. Forecast future resources and budgetary needs using financial documents (e.g., balance sheet demand forecasting, financial ratios).
- 1.8.3. Analyze the performance of organizational activities and reallocate resources to achieve established goals.
- 1.8.4. Identify alternative actions to take when goals are not met (e.g., changing goals, changing strategies, efficiencies).
- 1.8.5. Use inventory and control systems to purchase materials, supplies and equipment (e.g., Last In, First Out [LIFO]; First In, First Out [FIFO]; Just in Time [JIT]; LEAN).
- 1.8.7. Collect information and feedback to help assess the organization's strategic planning and policymaking processes.
- 1.8.8. Identify routine activities for maintaining business facilities and equipment.
- 1.8.10. Analyze how business management and environmental management systems (e.g., health, safety) contribute to continuous improvement and sustainability.

Outcome: 1.12. Cyber Hygiene

Apply digital information security principles to keep information secure.

Competencies

- 1.12.1. Identify the purpose and practices of Cyber Hygiene.
- 1.12.2. Differentiate between appropriate and inappropriate information.
- 1.12.3. Interpret security policies through job specific training and training updates.
- 1.12.4. Apply secure password behavior.
- 1.12.5. Apply physical and virtual situational awareness (e.g., clean desk policies, shoulder surfing, social engineering, tailgating).

Strand 2. IT Fundamentals

Learners apply fundamental principles of IT, including the history of IT and its impact on society, common industry terms, systems theory, information storage and retrieval, database management, and computer hardware, software, and peripheral device configuration and installation. This base of knowledge and skills may be applied across the career field.

Outcome: 2.8 Databases

Describe the fundamentals of databases.

Competencies

- 2.8.1. Identify types of databases (e.g. Relational, Object-oriented, NoSQL, Graph, Data Warehouse, Distributed, Open Source, Cloud, Artificial Intelligence).
- 2.8.2. Describe the use and purpose of a database and a Database Management System (DBMS).
- 2.8.3. Compare database structures (e.g., flat file, hierarchical, relational, data lakes, object-oriented, cloud, multi-modal).
- 2.8.4. Describe the elements of a database (e.g., table, record/row, field, relationships, transactions, schema, normalization, keys).
- 2.8.5. Describe the elements of the database front-end that allow users to access, modify, delete, or insert data. (e.g., form, filters, reports)
- 2.8.7. Describe how data can be stored in and extracted from a database.
- 2.8.8. Explain the importance of data integrity and security.
- 2.8.9. Differentiate between a front-end interface and a back-end database.

Outcome: 2.10. Equipment

Select, prepare, operate, and maintain equipment.

Competencies

- 2.10.1. Identify hardware platforms, configurations, and support models.
- 2.10.2. Identify processor, memory, storage, power, and environmental requirements.
- 2.10.3. Identify architecture requirements.
- 2.10.5. Prepare and operate equipment per project design specifications.
- 2.10.6. Monitor equipment operation and troubleshoot issues and problems.
- 2.10.7. Backup, restore, test, archive, and manage data.
- 2.10.8. Prepare equipment for storage or decommissioning.
- 2.10.9. Perform routine maintenance per manufacturer specifications.

Outcome: 2.11. Troubleshooting

Select and apply troubleshooting methodologies for problem solving.

Competencies

- 2.11.1. Identify the problem.
- 2.11.2. Select troubleshooting methodology (e.g., top down, bottom up, follow the path, spot the differences).
- 2.11.3. Investigate symptoms based on the selected methodology.
- 2.11.4. Gather and analyze data about the problem.
- 2.11.5. Design a solution.
- 2.11.6. Test a solution.
- 2.11.7. Implement a solution.
- 2.11.8. Document the problem and the verified solution.

Outcome: 2.12. Performance Tests and Acceptance

Develop performance tests and acceptance plans.

Competencies

- 2.12.1. Create a written procedure agreed by the stakeholders and project team for determining the acceptability of the project deliverables.
- 2.12.2. Develop a test system that accurately mimics external interfaces.
- 2.12.3. Develop test cases that are realistic, compare with expected performance, and include targeted platforms and device types.
- 2.12.4. Develop, perform, and document usability and testing integration.
- 2.12.5. Make corrections indicated by test results.
- 2.12.6. Seek stakeholder acceptance upon successful completion of the test plan.

Strand 8. Databases

Learners apply principles of designing, creating, and maintaining databases, including data storage, retrieval, modeling, manipulation, and formatting; database access, management, and administration; and database hardware and software issues.

Outcome: 8.1. Data Modeling

Develop a data model to describe an application's data.

Competencies

- 8.1.1. Develop specifications for a database in consultation with the client.
- 8.1.2. Understand levels of data abstraction models (e.g., conceptual, logical, physical, and view).
- 8.1.3. Select the data model(s) based on client specifications (e.g., hierarchical, relational, object-oriented, entity-relationship, document, entity-attribute-value, star, object-relational, multidimensional, graph, multivalued, document).
- 8.1.4. Identify relationships between database entities (e.g., primary key/foreign key, nodes/relationships, key/value).
- 8.1.5. Determine the format required for data storage based upon the data model.
- 8.1.6. Determine constraints based upon the data model (e.g., null, unique, primary key, foreign key, and custom).
- 8.1.7. Normalize or denormalize the data model as appropriate for the application.
- 8.1.8. Generate data modeling documentation (e.g., entity-relationship, workflow, Unified Modeling Language [UML], data dictionary, tree).
- 8.1.9. Verify that the data model matches specifications.

Outcome: 8.2. Design and Creation

Design and create databases.

Competencies

- 8.2.1. Name database objects with proper naming conventions.
- 8.2.2. Define constraints to satisfy project goals (e.g., primary key, foreign key, index).
- 8.2.3. Implement data integrity, security, encryption and regulatory restrictions (e.g. HIPPA, FERPA).

Outcome: 8.3. Data Entry and Access

Enter and access data in databases.

Competencies

- 8.3.1. Collect and maintain data in the database (e.g., insert, update, delete).
- 8.3.2. Import large data sets into a database (e.g., bulk command, SQL script, CSV file).

8.3.3. Implement data validation (e.g., format check, range check, length check).

Outcome: 8.4. Database Management

Manage databases.

Competencies

- 8.4.1. House database files in an environment appropriate to anticipated user demand.
- 8.4.2. Control user access to data.
- 8.4.3. Log access to the database by user and type of transaction.
- 8.4.4. Backup, verify, and recover data.
- 8.4.5. Optimize a database for best performance (e.g. indexes, query generation, monitoring efficiency)
- 8.4.6. Implement data migration (e.g. different location, environment, file format, application).

Outcome: 8.5. Queries and Transactions

Perform data queries and database transactions.

Competencies

- 8.5.1. Write Structured Query Language (SQL) scripts and stored procedures.
- 8.5.2. Commit and roll back transactions.
- 8.5.3. Retrieve, filter, sort, and parse data.
- 8.5.4. Generate and print forms, reports, and results of queries (e.g., calculated fields, functions).