**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 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 2.3. Data Encoding**

Explain and describe data encoding basics.

**Competencies**

2.3.1. Identify and explain coding information and representation of characters (e.g., American Standard Code for Information Interchange [ASCII], Extended Binary Coded Decimal Interchange Code [EBCDIC], Unicode).

2.3.2. Convert between numbering systems (e.g., binary, hexadecimal, decimal).

**Outcome 2.4. Emerging Technologies**

Identify trending technologies, their fundamental architecture, and their value in the marketplace.

**Competencies**

2.4.1. Investigate the scope and the impact of mobile computing environments on society.

2.4.2. Describe the differences, advantages, and limitations of cloud computing (e.g., public cloud, private cloud, hybrid cloud) and on premises computing.

2.4.3. Utilize cloud computing applications (e.g., services, applications, virtual environments).

**Outcome: 2.8 Databases**

Describe the fundamentals of databases.

**Competencies**

2.8.1. Identify emerging database technology (e.g., Not only Structured Query Language [NoSQL], New Structured Query Language [NewSQL], graph databases).

2.8.2. Describe the use and purpose of a database and a Database Management System (DBMS).

2.8.3. Compare databases (e.g., flat file, hierarchical, relational).

2.8.4. Describe the elements of a database (e.g., table, record/row, field, relationships, transactions).

2.8.5. Describe the elements of a database user interface (e.g., form, queries, filters, reports).

2.8.6. Describe Structured Query Language (SQL)

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: 2.9. Project Concept Proposal**

Develop a project concept proposal.

**Competencies**

2.9.1. Identify and incorporate branding strategies.

2.9.2. Determine the scope and purpose of the project.

2.9.3. Determine the target audience, client needs, expected outcomes, objectives, and budget.

2.9.4. Develop a conceptual model and design brief for the project.

2.9.5. Develop a timeline, a communication plan, a task breakdown, costs (e.g., equipment, labor), deliverables, and responsibilities for completion.

2.9.6. Develop and present a comprehensive proposal to stakeholders.

**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 Plans**

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.

**Outcome: 2.13. Rollout and Handoff**

Plan rollout and facilitate handoff to customer.

**Competencies**

2.13.1. Include overall project goals and timelines in the rollout plan.

2.13.2. Communicate rollout plans to key stakeholders in a timely manner.

2.13.3. Conduct final review and approvals according to company standards.

2.13.4. Identify support staff, training needs, and contingency plans in the rollout plan.

2.13.5. Test delivered application to assure that it is fully functional for the customer or user and meets all requirements.

**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. Identify the real-world entities (e.g., customers, purchases) to put in a table and the attributes of the entities (e.g., customer names and addresses, purchase dates and amounts).

8.1.3. Identify the relationships between database entities.

8.1.4. Determine the data types (e.g., text, numbers) and domains (e.g., number greater than zero, text string of two letters) of attributes.

8.1.5. Determine whether attributes allow for null value.

8.1.6. Determine unique identifiers (i.e., keys) of entities.

8.1.7. Normalize data model as appropriate for the application.

8.1.8. Generate data modeling documentation (e.g., entity-relationship, workflow, Unified Modeling Language [UML]).

8.1.9. Verify that the data model matches specifications.

**Outcome 8.2. Design and Creation**

Design and create databases.

**Competencies**

8.2.1. Design and create database tables and relationships.

8.2.2. Create database columns and specify properties (e.g., name, type, domain).

8.2.3. Name tables and fields in conformance with naming conventions.

8.2.4. Define indexes as appropriate for the application.

**Outcome 8.3. Data Entry and Access**

Enter and access data in databases.

**Competencies**

8.3.1. Insert, update, and delete records.

8.3.2. Enter and bulk import data into databases and transfer data between databases.

8.3.3. Write Structured Query Language (SQL) scripts and stored procedures.

8.3.4. Retrieve, filter, sort, and parse data.

8.3.5. Commit and roll back transactions.

8.3.6. Generate and print forms, reports, and results of queries (e.g., calculated fields, functions).

**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 database by user and type of transaction.

8.4.4. Backup, verify, and recover data.