Computer Science II: Databases introduces students to the basic concepts of databases including types of databases, general database environments, and the importance of data to the business world. Discussion with hands-on activities will include database design, normalization of tables, and development of tables, queries, reports, and applications. Students will be familiarized with the use of ANSI standards Structured Query Language. Discussions will include database administration and data maintenance. Students will be introduced to data concepts such as data warehousing, data mining, and BIG data. Students will develop a business application using database software such as Microsoft Access. Students will be required to demonstrate skills such as team building, work ethic, communications, documentation, and adaptability.

- DOE Code: 5250
- Recommended Grade Level: 11, 12
- Required Prerequisite: Computer Science I and Computer Science II
- Credits: 2 semester course, 2 semesters required, 1-3 credits per semester, 6 credits maximum
- Counts as a Directed Elective or Elective for all diplomas
- Qualifies as a quantitative reasoning course

Dual Credit
This course provides the opportunity for dual credit for students who meet postsecondary requirements for earning dual credit and successfully complete the dual credit requirements of this course. The Dual Credit crosswalk can be accessed here.

Application of Content and Multiple Hour Offerings
Intensive laboratory applications are a component of this course and may be either school based or work based or a combination of the two. Work-based learning experiences should be in a closely related industry setting. Instructors shall have a standards-based training plan for students participating in work-based learning experiences. When a course is offered for multiple hours per semester, the amount of laboratory application or work-based learning needs to be increased proportionally.

Career and Technical Student Organizations (CTSOs)
Career and Technical Student Organizations are considered a powerful instructional tool when integrated into Career and Technical Education programs. They enhance the knowledge and skills students learn in a course by allowing a student to participate in a unique program of career and leadership development. Students should be encouraged to participate in Business Professional of America, DECA, or Future Business Leaders of America, the CTSOs for this area.
Content Standards

Domain – Database Design and Management

Core Standard 1  Students design and manage databases.

Standards

CS2D-1.1  Identify types and nature of databases in a business setting
CS2D-1.2  Understand and apply terminology of database usage
CS2D-1.3  Evaluate data and performance needed to inform decision making in a business setting
CS2D-1.4  Describe the differences among relational, hierarchical, and network database structures
CS2D-1.5  Compare structured versus unstructured data using database management systems
CS2D-1.6  Describe general structure and organization of a relational database and explain the functions of the basic relational operators
CS2D-1.7  Apply normalization techniques to the design of databases, and define and describe the 1NF, 2NF, 3NF, and BCNF
CS2D-1.8  Analyze the impact of database size and performance on technology
CS2D-1.9  Explain how defining and creating database files affects computer space and performance
CS2D-1.10 Plan, design, create and modify a database using objects and elements
CS2D-1.11 Describe, define, and use basic data types
CS2D-1.12 Create stored procedures and functions
CS2D-1.13 Describe database field names, field types, relationships among tables, and create and entity-relationship diagram (ERD)
CS2D-1.14 Create database objects, retrieve, and manipulate data using SQL commands
CS2D-1.15 Identify data integrity and security requirements
CS2D-1.16 Discuss the concepts and use of BIG data, data warehousing, and data mining
CS2D-1.17 Explain the fundamental concepts of an information system, including the life cycle, components, and flow of information within an organization
CS2D-1.18 Discuss the basic use of statistics and reporting within an organization
CS2D-1.19 Synthesize project management best practices to create a database
CS2D-1.20 Design a database by collaborating with other students or external parties

Domain – Administration and Management

Core Standard 2  Students analyze the administrative and managerial considerations for a database.

Standards

CS2D-2.1  Investigate best practices in database administration
CS2D-2.2  Identify data integrity and security requirements
CS2D-2.3  Create documentation for a database
CS2D-2.4  Assess normalization techniques
CS2D-2.5  Analyze the relationship between database design and storage requirements
Domain – Database Servers and Virtual Environments

Core Standard 3 Students explore the creation of a virtual server/environment.

Standards
CS2D-3.1 Demonstrate the ability to create a virtual server for a database management system
CS2D-3.2 Explain the concepts of server, network, and storage virtualization
CS2D-3.3 Discuss the advantages/disadvantages of server virtualization
CS2D-3.4 Identify the software components required for an installation such as applications, drivers, libraries, and supporting utilities
CS2D-3.5 Identify hardware requirements for an installation – storage space, memory, processor speed
CS2D-3.6 Install and configure a database management system within a virtual environment
CS2D-3.7 Import, export, and replicate a virtual server instance between multiple virtual environments
CS2D-3.8 Discuss the considerations for installing updates and patches to the server and the virtual environment
CS2D-3.9 Implement a backup and recovery strategy for the virtual environment
CS2D-3.10 Discuss security and licensing issues related to virtualized systems

Domain – Structured Query Language (SQL)

Core Standard 4 Students utilize the main SQL statements while creating databases.

Standards
CS2D-4.1 Discuss procedural versus declarative languages
CS2D-4.2 Use SQL to identify and describe the structure and contents of a database
CS2D-4.3 Design data definition language (DDL) statements to create and manage tables
CS2D-4.4 Implement keys and constraints to ensure data and referential integrity
CS2D-4.5 Utilize SQL data manipulation language (DML) commands to insert, update, and delete data
CS2D-4.6 Distinguish between Data Control Language (DCL) and Transaction Control Language (TCL) statement controls for access levels on database objects and maintaining integrity
CS2D-4.7 Utilize SQL commands to retrieve data from single and multiple tables
CS2D-4.8 Use the Set Operators to combine the results of multiple queries
CS2D-4.9 Demonstrate the use of table joins and aggregate functions
CS2D-4.10 Modify SQL commands to restrict and sort data
CS2D-4.11 Use single-row and multiple-row subqueries to improve query performance
CS2D-4.12 Differentiate between single-row and multi-row functions
CS2D-4.13 Demonstrate the use of Arithmetic and Logical expressions, and Conversion Functions
CS2D-4.14 Utilize optimization and performance tips
CS2D-4.15 Create and utilize schema objects including views, sequences, indexes, and synonyms
Domain – Oracle Database Mechanisms

Core Standard 5 Students employ Oracle to produce a database.

Standards

CS2D-5.1 Describe Oracle Database Architecture
CS2D-5.2 Perform an installation and configuration of an Oracle database
CS2D-5.3 Configure Oracle Net services
CS2D-5.4 Configure and manage the database storage structures
CS2D-5.5 Create and administer user accounts
CS2D-5.6 Perform basic backup and recovery of a database
CS2D-5.7 Create and implement a plan to manage users and schemas
CS2D-5.8 Construct and implement a plan for the management of data and concurrency
CS2D-5.9 Perform administration and monitoring of undo data
CS2D-5.10 Analyze and monitor performance using administration tools to adjust the database configuration
CS2D-5.11 Use the database diagnostic monitor

Domain – Business Intelligence, Data Warehousing, and Reporting

Core Standard 6 Students discuss data harvesting and storage as it relates to business intelligence.

Standards

CS2D-6.1 Explain the key concepts and techniques related to business intelligence
CS2D-6.2 Explain the key concepts and techniques related to data warehousing
CS2D-6.3 Summarize the differences between data warehousing, data mining, and BIG data
CS2D-6.4 Analyze data to generate information for decision making
CS2D-6.5 Extract, maintain, summarize, and visualize information
CS2D-6.6 Explain the societal impacts and ethical dimensions of business intelligence and data warehousing
CS2D-6.7 Analyze and utilize data trends related to information
CS2D-6.8 Create reports for business users
CS2D-6.9 Explain the value of business intelligence and data warehousing systems and technologies
CS2D-6.10 Explain data selection for business reporting

Domain – Database Career Pathway

Core Standard 7 Students investigate career pathways related to database.

Standards

CS2D-7.1 Use appropriate technology and resources to research and organize information about careers
CS2D-7.2 Analyze career trends, options and opportunities (outlook) for employment and entrepreneurial endeavors
CS2D-7.3 Evaluate selected careers and pathways for roles and responsibilities, education requirements, working conditions, benefits, and opportunities for growth and change
CS2D-7.4 Demonstrate understanding of postsecondary educational options including technical certificate programs, apprenticeship, military and two- and four-year college programs