Indiana Department of Education
Academic Standards Course Framework

COMPUTER SCIENCE III: DATABASES

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