

COURSE OUTLINE

SCHOOL: School of Engineering Technology and Applied Science

DEPARTMENT: Information and Communication Engineering Technology (ICET)

PROGRAM: Software Engineering Technician/Technologist (3109, 3119, 3408, 3409, 3419, 3508, and 3508)

COURSE TITLE: Introduction to Databases

COURSE CODE: COMP122

TOTAL COURSE HOURS: 60 Hours

PRE-REQUISITES/CO-REQUISITES: COMP100

**COURSE ELIGIBILITY FOR PRIOR LEARNING
ASSESSMENT AND RECOGNITION (PLAR):** Yes

ORIGINATED BY: Bhim Harlal

REVISED BY: Bhim Harlal

DATE: August 2009

APPROVED BY:

Chairperson/Dean

Academic Year: 2009 - 2010

Students should keep all course outlines for each course taken at Centennial College. These may be used to apply for transfer of credit to other educational institutions. A fee may be charged for additional or replacement copies.

COURSE DESCRIPTION:

This course introduces students to relational database concepts, as related to personal, client server, and enterprise database systems. Topics will include data types, table structure, and relationships, data access queries using QBE grid and SQL, normalization, and database security. These concepts will be reinforced using Microsoft Access. Oracle will also be briefly introduced and used for queries. Microsoft Visio will be used as the diagramming tool to create ERDs

COURSE LEARNING OUTCOMES:

- Explain the term Database and Database Management System (DBMS), as well as the use of Primary and Foreign Keys.
- Design simple table structures and associate them to a prescribed business problem.
- Determine cardinality between tables, and use cardinality symbols (Crow's Foot notation) to represent 1-1, 1-M, and M-N relationships.
- Use Cardinality symbols to draw Entity Relation Diagrams (ERDs) to model tables and relationships.
- Explain fundamental differences between logical and physical database design
- Interpret the SQL script generated in the creation of simple queries in an Access environment.
- Use SQL Data Definition Language (DDL) to create simple relational databases.
- Use SQL Data Manipulation Language (DML) to create and query sample data.
- Use normalization techniques to remove redundancies in tables.
- Apply security measures such as password, encryption, and hiding database objects to secure data in Access databases.

ESSENTIAL EMPLOYABILITY SKILLS (EES)

This course supports the students' ability to:

- Communicate clearly, concisely, and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience.
- Respond to written, spoken, or visual messages in a manner that ensures effective communication.
- Apply a systematic approach to solve problems.
- Locate, select, organize, and document information using appropriate technology and information systems.
- Analyze, evaluate, and apply relevant information from a variety of sources.
- Show respect for the diverse opinions, values, belief systems, and contributions of others.
- Interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals.
- Manage the use of time and other resources to complete projects.
- Take responsibility for one's own actions, decisions, and consequences.

PRIOR LEARNING ASSESSMENT & RECOGNITION PROCESS (ES):

This course is eligible for PLAR through the Registrar and SETAS offices. Assessment of portfolio and/or testing may be discussed with faculty.

EVALUATION & GRADING SYSTEM:

Two criteria are used to determine whether a student has achieved a passing grade in this course:

- a) An overall 50% grade based on the grading scheme below, and
- b) A 50% grade in the test/exam, component of the course. Successful completion of project is also required.

Assignments and Quizzes	15%
Group Project	15% (Not more than 4 persons per group)
MID TERM	30%
FINAL EXAM (Comprehensive)	40%
TOTAL	100%

STUDENT ACCOMMODATION:

All students have the right to study in an environment that is free from discrimination and/or harassment. It is College Policy to provide accommodation based on grounds defined in the *Ontario Human Rights Code*. Accommodation may include changes or modifications to standard practices.

Students with disabilities who require academic accommodations must register with the Centre for Student with Disabilities. Please see the Centre for Students with Disabilities for details.

Students requiring accommodation based on human rights grounds should talk with their professors as early as possible. Details are available on the Centennial College website (www.centennialcollege.ca).

If students are unable to write an examination due to a medical problem or unforeseen family problems, they should immediately contact their professor or program Chair for advice. In exceptional and well documented circumstances (e.g. unexpected family problems, serious illness, or death of a close family member), students should be able to write a make-up examination to replace an examination missed.

TEXT AND OTHER INSTRUCTIONAL/LEARNING MATERIALS:**Lecture Text:**

Database Systems. Design, Implementation, and Management, Eight Edition, by Peter Rob and Carlos Coronel
Publisher: Course Technology
ISBN – 10: 1-4239-0201-7

Lab Text:

New Perspective. Access 2007, Comprehensive by Joseph J. Adamski and Kathleen T. Finnegan
Publisher: Course Technology
ISBN – 10: 1-4239-0589-X

Web Site content from Course Technology as assigned.

USE OF DICTIONARIES

- Any dictionary (hard copy or electronic) may be used in regular class work;
- Only English Language Learner dictionaries are permitted in class work (English words, idioms, and pronunciations are explained);
- English-Additional Language (e.g. English-Mandarin) or Additional Language-English (e.g. Russian-English) dictionaries may be used in regular class work;
- Dictionaries may be used in tests and examinations, or in portions of tests and examinations, as long as they are non-electronic (not capable of storing information) and hard copy (reviewed by the invigilator to ensure notes are not incorporated that would affect test or examination integrity);

POLICY STATEMENTS

College Policies

The following statements are selected from Centennial College policies approved by the Board of Governors.

Student Responsibilities

Students are expected to know the contents of the course outline and to discuss with the professor any areas where clarification is required.

Students should keep all course outlines for each course taken at Centennial College. These may be used to apply for transfer of credit to other educational institutions. A fee may be charged for additional or replacement copies.

Other Policies

Students should familiarize themselves with all College Policies that cover students' rights, responsibilities, and the Academic Appeal process. For further information, consult the Academic Matters Section in the full-time and Continuing Education calendars. The Academic Appeal Application form is available from any Enrolment Services Office.

Proof of Student Status

Students must produce official photo identification at any time during the semester when requested to do so by any professor. (The official piece is the Centennial Student Card.) Continuing Education students do not have Centennial Student Cards, and so they may use other forms of photo identification, such as a driver's license, health card, or other government-issued photo identification.

Final Examinations

When writing a test or examination, students must put their official photo-ID cards in full view for review by the invigilator. Students who do not have official photo-ID will be permitted to write the examination with a substitute photo-ID, but they will be required to produce photo-ID at the program or department office within 24 hours or the next business day following the examination, or else the examination results will be void.

More Final Examination Policies are available at <http://my.centennialcollege.ca>.

Academic Progression Policy for Diploma and Certificate Programs:

College Academic Standings will be applied. Please see Academic Policies and Procedures, Full-Time Calendar.

Faculty Consultation

Professors are available to see students outside of class time. Students can contact professors via voice mail, email, or through their program or department office. Information regarding how to contact teachers will be provided at the beginning of the course and is also available in the program or department office.

Human Rights Statement

It is the policy of the College that all programs will strive for a learning, teaching, and working environment that promotes inclusion, understanding, and respect for all students and employees, consistent with the *Ontario Human Rights Code* and Centennial College's *Statement of Diversity*.

TOPICAL OUTLINE

Week	Topic/Content	Readings	Instructional Objectives	Instructional Strategies/ Tests and Assignments
1	Discuss course materials, lab exercises and project requirements. Overview of Database System			
2	Introduction to database system: Data vs. information Database and database management systems. Role and advantages of the DBMS. Types of databases. Importance of a well designed database Structural and data dependence. Field definition and naming conventions. Database system environment. Functions of database management systems.	Chapter 1	<ul style="list-style-type: none"> • Differentiate between data information • Define the following key terms: database, Database Management System (DBMS), metadata, data inconsistency, query, single user database, multi-user database, enterprise database, centralized database, distributed database, operational database, data warehouse, data integrity, data anomaly, query language, Structured Query Language (SQL) • Describe briefly the different types of databases and explain why they are valuable assets for decision making. • Explain the importance of database design. • Explain the term structural dependence and data dependence • Differentiate between logical data format and physical data format • List and briefly describe the main components of a database system. • Define the term data redundancy and explain its effects on the quality of information produced. • Differentiate among update anomaly, insertion anomaly and deletion anomaly • Explain how a database system differs from a file system • List the main functions of a database management system 	Complete Lab Tutorial 1: Creating a Database and Case Problem 1 (AC-38 to AC-39)
3	Data Models: Importance of data models Data model basic building blocks Business rules Evolution of data models Data independence and the ANSI/SPARC three levels of data abstraction (three schema architecture) External Model, External Schema, Conceptual Model, Conceptual Schema, Internal Model, Internal Schema	Chapter 2	<ul style="list-style-type: none"> • Define the following key terms: attribute, relationship, constraint, business rule, entity instance, connectivity, schema, external schema, conceptual schema, internal schema. • Explain why data models are important. • Describe the basic building blocks of all data models. • Explain why identifying and documenting business rules are essential to database design. • Explain how the major data models evolved. • Explain the purpose and origin of the three levels of 	Complete Lab: Tutorial 2 Building a Database and Defining Table Relationships, and Case Problem 1 (AC-89 to AC-91)

Week	Topic/Content	Readings	Instructional Objectives	Instructional Strategies/ Tests and Assignments
			data abstraction; external conceptual and internal.	
4	The Relational Database Model: Logical view of data Tables and their characteristics Relational database keys; superkey, candidate key, primary key, secondary key, foreign key Use of functional dependency to describe the relationship between attributes. Entity integrity, referential integrity and integrity rules.	Chapter 3	<ul style="list-style-type: none"> Explain how relational database enables data to be viewed logically rather than physically. Explain the characteristics of relational table. Define the following key terms: key, superkey, candidate key, primary key, secondary key, foreign key, entity integrity, referential integrity. Identify and apply entity integrity and referential integrity rules. 	Complete Lab: Tutorial 3 Maintaining and Querying a Database, and Case Problem 1 (AC-146 to AC-147)
5	The Relational Database Model Cont'd Relational set operators: SELECT, PROJECT, JOIN, INTERSECT, UNION, DIFFERENCE, PRODUCT, DIVIDE Joining tables: natural join, equijoin, left outer join, right outer join, Relationships within the relational database: one-to-one relationship (1:1) one-to-many relationship (1:M) many to many relationship (M:N) Implementing the M:N relationship in the relational environment by breaking it into two 1:M relationships. Role of foreign key in minimizing data redundancy and data anomalies. Indexes and their usage in the relational database environment.	Chapter 3	<ul style="list-style-type: none"> Define and apply the following set operators to manipulate table contents: SELECT, PROJECT, JOIN, INTERSECT, UNION, DIFFERENCE, PRODUCT, DIVIDE Identify when to use and apply the following to join tables: natural join, equijoin, left outer join and right outer join to extract data from more than one table. Define and use the following relationships: one-to-one relationship, one-to-many relationship, many-to-many relationship in the conceptual model design. Apply the many-to-many relationship in the relational environment by breaking it into two 1:M relationships. Identify and apply foreign keys Explain how foreign keys help to minimize data redundancies and data anomalies. Explain and apply indexes in the relational database environment. 	Complete Lab: Tutorial 4 Creating Forms and Reports, and Case Problem 1 (AC-191 to AC-192)
6	Introduction to Structured Query Language (SQL) DDL commands Creating the database, Database Schema, Data Types, creating table structures, SQL constraints, SQL Indexes DML commands Adding, updating, deleting and listing table rows, saving table changes, restoring table contents Select Queries Selecting rows with conditional restrictions, Arithmetic Operators, rule of precedence,	Chapter 7	<ul style="list-style-type: none"> Differentiate between Data Definition Language (DDL) and Data Manipulation Language (DML) Describe some essential SQL Data Definition commands and SQL Data Manipulation commands. Interpret and use different data types used by Access and Oracle. Apply DDL commands of SQL to create tables, views, and indexes. Apply DML commands of SQL to select, insert, update, delete, and retrieve data. Use SQL where Clause to add conditional restrictions to the SELECT Statement. Explain and use arithmetic operators and the rules of 	Complete Lab: Tutorial 5 Creating Advanced Queries and Enhancing Table Design, and Case Problem 1 (AC-251 to AC-253)

Week	Topic/Content	Readings	Instructional Objectives	Instructional Strategies/ Tests and Assignments
			precedence for computed fields.	
7	Introduction to Structured Query Language (SQL) Cont'd Select Queries Cont'd Logical Operators: AND, OR, NOT, Special Operators: BETWEEN, IS NULL, LIKE, IN, EXISTS Advanced DDL commands Changing column's Data Type, and Data Characteristics, Adding and Dropping a column, Advanced Data Updates, Adding Primary and Foreign key Designations, Deleting table Advanced Select Queries Ordering a listing with ORDER BY clause, Listing unique values with DISTINCT clause, Aggregate Functions: COUNT, MAX, MIN, SUM, AVG, Grouping Data with GROUP BY clause, and the GROUP BY with the HAVING clause Joining Tables		<ul style="list-style-type: none"> • Explain and use logical operators AND, OR, and NOT • Use special operators such as BETWEEN, IS NULL, LIKE, IN, and EXISTS in conjunction with the WHERE Clause. • Explain and use the aggregate function: COUNT, MAX, MIN, SUM, and AVG for mathematical summaries • Use the ALTER command to add a column and drop a column • Use the DROP TABLE command to delete a table from the database • Use the ORDER BY clause to sort a listing in ascending or descending order • Use GROUP BY clause in conjunction with an SQL aggregate function such as COUNT, MIN, MAX, AVG, and SUM to obtain summary row data, or subtotals in reports. 	Complete Lab Tutorial 6 Using Form Tools and Creating Custom Forms, and Case Problem 1 (AC-324 to AC-326)
8	MID TERM		•	
9	Entity Relationship (ER) Modelling Entities, Attributes, Chen Model, and Crow's Foot model, Relationships: 1:1, 1:M, M:N, Connectivity and Cardinality, minimum and maximum cardinalities, Existence dependence, Relationship strength: weak and strong relationships, Weak entity	Chapter 4 And Text Web Site Appendix A - VISIO/Web site	<ul style="list-style-type: none"> • Define the terms: Entities, attributes, domain, composite primary key, simple attribute, composite attribute, single-valued attributes, multivalued attributes, and derived attributes • Identify and provide suitable name that is descriptive of the relationship • Differentiate between weak and strong and weak relationships 	Complete Lab: Tutorial 9 Using Action Queries and Advanced Table Relationships, and Case Problem 1 (AC-480 to AC-481) Creating a Basic ERD with Visio Professional Editing Relationships with Visio Professional
10	Entity Relationship Modelling Cont'd Relationship participation: optional participation, mandatory participation, Relationship degree: unary, binary, ternary, Recursive relationships, Composite entities. Developing Entity Relationship Diagrams	Chapter 4 And Text Web Site Appendix A - VISIO/Web	<ul style="list-style-type: none"> • Explain and identify suitable Crow's foot symbols and notations that are used in ERDs • Define cardinality and use appropriate cardinality symbols to indicate 1:1, 1:M, and M:N relationships • Define the terms optional cardinality, and mandatory cardinality and use them in establishing constraints 	Complete Lab: Tutorial 10 Automating Tasks with Macros Creating, viewing, testing, and modifying a switchboard.

Week	Topic/Content	Readings	Instructional Objectives	Instructional Strategies/ Tests and Assignments
	(ERDs) from database systems narratives Microsoft Visio Professional to be used as diagramming tool for ERDs	site	<ul style="list-style-type: none"> on ERD's Differentiate among unary, binary, and ternary relationships Define and identify recursive relationships Explain the meaning and purpose of composite entity Draw ERDs from database systems narratives 	Group Project Design and Development
11	Normalization of Database Tables Database table and normalization Need for normalization The normalization process Conversion to First Normal Form Conversion to Second Normal Form Conversion to Third Normal Form	Chapter 5	<ul style="list-style-type: none"> Describe functional dependence and use it to determine functional dependencies among table attributes Define the terms normal form, and normalization Explain the need for converting a large table to many smaller tables using the first normal form (1NF), second normal form (2NF), and third normal form (3NF) Identify modification anomalies in tables that are not in 1NF, 2NF, and 3NF Normalize tables by detecting violations of the normal forms and apply normalization rules 	Group Project Design and Development
12	Normalization of Database Tables cont'd Surrogate Key Considerations Normalization and Database Design Denormalization	Chapter 5	<ul style="list-style-type: none"> Explain how normalization and ER modeling can be used concurrently to produce good database design Explain how some situation require denormalization to generate information efficiently . 	Group Project Design and Development
13	Introduction to Oracle Table Creation using SQL Statements Queries Design using SQL Statements	Handouts	<ul style="list-style-type: none"> Creating tables in Oracle Designing and Creating Queries 	Hands-on Oracle Exercises on Table Creation and Queries
14	Review and Group Project Presentations			Oral presentation of Projects by Groups
15	Comprehensive Final Examination			