NEW YORK CITY COLLEGE OF TECHNOLOGY
COMPUTER SYSTEMS TECHNOLOGY DEPARTMENT
COURSE OUTLINE
CST3504 – Database Design

COURSE DESCRIPTION (4 Class Hours, 3 Credits)

This course is dedicated to an overview of the database design process. The three main phases in database design, namely: conceptual, using Entity Relational Diagram (ERD) and Unified Modeling Language (UML); logical, using the relational model, and physical, using the Oracle Database Management System (DBMS), are covered. The basics of the relational data model (concepts of relation, attribute, primary key, and foreign key) are reviewed, and the mapping of the conceptual model to the relational model is discussed. Advanced concepts of relational theory (normalization, denormalization) are included. The Physical model of the database is built in Oracle. Students must be familiar with SQL.

COURSE OBJECTIVES

After completing the course, the students should be able to participate in the design of a database. They should::

- Understand the business requirements and build the conceptual model of a database using ERD and UML.
- Build the relational model of the database by mapping the conceptual model into the set of relations.
- Build the physical model of the database in Oracle.
- Implement the physical model of the database in Oracle.
- Maintain the database (insert, update, delete, and retrieve data).

ASSESSMENT CRITERIA

Students will be assessed in exams, homework, case assignments, and through class participation. The major areas include:

- The basic understanding of the conceptual, relational, and physical data model.
- Understanding the constructs used on an ERD
- Developing a data model for an application system
- Drawing an ERD using a Modeling or CASE tool
- Implementing the Model using Oracle
- Maintaining the Oracle database

General Education Outcomes

- **SKILLS/Inquiry/Analysis:** Students will employ scientific reasoning and logical thinking.
- **SKILLS/Communication:** Students will communicate in diverse settings and groups, using written (both reading and writing), oral (both speaking and listening), and visual means.
- **VALUES, ETHICS, RELATIONSHIPS / Professional/Personal Development:** Students will work with teams, including those of diverse composition. Build consensus. Respect and use creativity.

PREREQUISITES

Completion of CST2304 with a grade not lower than C.

REQUIRED TEXTBOOKS

1. *Modern Database Management*, J. Hoffer, R. Venkataraman, H. Topi. 12th edition, Prentice Hall (Pearson), 2015. ISBN-10: 0133544613 • ISBN-13: 9780133544619
2. *A Guide to SQL, P. Pratt,* Course Technology, 2010.

Academic Integrity Policy:

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience ar sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City

University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.

Grading:

Midterm	30%
Final	30%
Tests/Quizzes and Homework	20%
Project (Case Assignments)	20%
	100%

Case Assignments

Note: Case assignments (practical assignments) are similar to the cases from Chapters 3 and 4 of the required text.
They go through the following steps:

1. Build the conceptual model for a particular case using ERDs or enhanced ERDs..
2. Build the relational model of the database.
3. Build the physical model of the database based on the relational model , using the Oracle DBMS. Define the physical parameters of the tables, consider creating indexes, and implement user requirements that were not reflected in the relational model. Implement the database and maintain it using SQL (populate with data, modify data, retrieve data).
4. Perform various queries using SQL

Grading Policy:

You cannot get a passing grade unless all case assignments are completed.
The professor preserves the right to ask you to defend any of your case assignments or tests.
Late submissions: next day after the deadline – 80%, before the next class after the deadline – 60%, after the discussion in class – 0%.

COURSE OUTLINE

Unless specified, the referenced chapters are from the textbook.

Week 1-2

Concepts of database systems (Chapter 1)
- Traditional File Processing vs. Databases
- Advantages of Database Systems
- Database Development Process. Importance of Conceptual, Logical and Physical Design phases.
- Review of SQL

Week 3

Database Analyses and Conceptual Design (Chapter 2)
- Purpose of Analysis and Conceptual Design
- Information requirements and output of the phase
- ERD as tools of conceptual design
- Entity
- Relationship
- Review of SQL

Week 4

ERD (Chapter 2)
- Types of relationships
- Cardinality of relationships
- Modeling Examples. Practicing building the conceptual model (exercises of Chapter 3).

Week 5

Practicing building the conceptual model (exercises of Chapter 2).

Week 6

Practicing building the conceptual model (exercises of Chapter 2).

Week 7

The Enhanced ERD (Chapter 3)
- Supertypes, Subtypes
- Constraints in Supertype/Subtype Relationship
- Modeling Examples. Practicing building the conceptual model (exercises of Chapter 4).

Week 8

Midterm Exam

Logical Design (Chapter 5)
- Purpose of the Logical Design. Information Requirements and Output of the Phase
- Relational Model. Relations, Attributes, Domains. Integrity Constraints.
- Connection of Relational Model Concepts to the Objects of ERD
- Transforming ERD into Relational Model (for the conceptual models for exercises of Chapters 3 and 4).

Week 9

Logical Design (Chapter 4)
- Transforming ERD into Relational Model (for the conceptual models for exercises of Chapters 3 and 4).

Week 10

Relational Model (Chapter 4)
- Concept of Normalization
- Functional Dependencies
- First Three Normal Forms. Practical Significance of Normalization
- Denormalization

Week 11

Physical Design (Chapters 5, 6, 7)
- Purpose of Physical Design
- Information Requirements and Output of the Phase
- Review and analysis of Case Assignments 1 and 2.

Week 12-13

Physical Design (Chapters 5, 6, 7)
- Building the physical model in Oracle
- Tables, views, clusters, indexes

Week 14-15

Procedural extensions of SQL in DBMS
Most common objects of the database (indexes, views, clusters, triggers)
Implementation and maintenance (Chapters 5, 6, 7)
Review

Final Exam