



## COURSE DESCRIPTION FORM

**INSTITUTION** National University of Computer and Emerging Sciences (NUCES-FAST)

**PROGRAM (S) TO BE** BS(CS)

**EVALUATED**

### A. Course Description

(Fill out the following table for each course in your computer science curriculum. A filled out form should not be more than 2-3 pages.)

<b>Course Code</b>	CS-203
<b>Course Title</b>	Database Systems
<b>Credit Hours</b>	3+1
<b>Prerequisites by Course(s) and Topics</b>	CS-201 (Data Structures)
<b>Assessment Instruments with Weights</b> (homework, quizzes, midterms, final, programming assignments, lab work, etc.)	Mid-I: 15 Mid-II: 15 Assignments/Quizzes: 10 Project: 10 Final: 50
<b>Course Coordinator</b>	Dr. Zulfiqar Ali Memon
<b>URL (if any)</b>	
<b>Current Catalog Description</b>	Basic database concepts, Conceptual modelling, Relational data model, Relational theory and languages, Database design, SQL, Introduction to query processing and optimization, Introduction to concurrency and recovery with advance topics. This course provides students with the essential concepts, principles, and techniques of modern database systems from a user perspective. This means that the lecture focuses on the functionalities that are offered by database systems and not on the methods to implement them. Specifically, the course teaches students the ability to develop a solution for a real-world data management problem that requires the application of the theories and practices developed in class. From a theoretical point of view, this course covers the essential principles for the design, analysis, and use of computerized database systems. The design and techniques of conceptual modeling, database modeling, database system architecture, and user/program interfaces are presented in a unified way.
<b>Textbook (or Laboratory Manual)</b>	Ramez Elmasri & Shamkant B. Navathe, <i>Database Systems, Models, Languages, Design and Application Programming</i> , 7 <sup>th</sup> Edition, 2016.

for Laboratory Courses)																																															
<b>Reference Material</b>	1) Thomas Connolly, Carolyn Begg, <i>Database Systems: A practical approach to design, implementation and Management</i> , 6 <sup>th</sup> Edition, 2015. 2) C.J. Date, <i>An Introduction to Database Systems</i> , 8 <sup>th</sup> Edition, 2004																																														
<b>Course Goals</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="3" style="background-color: #d3d3d3; padding: 5px;"><b>A. 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	Solutions:	systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.																																																																																										
	5. Modern Tool Usage:	Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computing activities, with an understanding of the limitations.	✓																																																																																									
	6. Individual and Team Work:	Function effectively as an individual and as a member or leader in diverse teams and in multi-disciplinary settings.	✓																																																																																									
	7. Communication:	Communicate effectively with the computing community and with society at large about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions.																																																																																										
	8. Computing Professionalism and Society:	Understand and assess societal, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practice.																																																																																										
	9. Ethics:	Understand and commit to professional ethics, responsibilities, and norms of professional computing practice.																																																																																										
	10. Life-long Learning:	Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.																																																																																										
<b>C. Relation between CLOs and PLOs</b> (CLO: Course Learning Outcome, PLOs: Program Learning Outcomes)																																																																																												
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		8	✓	✓			✓	✓				
<b>Topics Covered in the Course, with Number of Lectures on Each Topic</b> (assume 15-week instruction and one-hour lectures)	<b>1. Topics to be covered:</b>											
		List of Topics					No. of Weeks	Contact Hours	CLO			
		Chapter 1 Introduction, Characteristics of Database Approach, Files Vs. Databases, Characteristics of Database approach, Advantages of using DBMS, When not to use DBMS,										
		Chapter 2 Data Model, Schema and Instance, three schema architecture and data independence, classification of DBMS, database languages & Interfaces, Database systems environment.					2	6	2,3			
		Chapter 5 Relational Model Concepts, Relational Model Constraints										
		Chapter 5 Relational Database Schemas, Update Operations, Transactions, and Dealing with Constraint Violations										
		Chapter 6 SQL Data Definition and Data Types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT, DELETE, and UPDATE Statements in SQL, Additional Features of SQL					2	6	2,3			
		Chapter 7 More Complex SQL Retrieval Queries, Views (Virtual Tables) in SQL, Schema Change Statements in SQL					1	3	1,2,3,4			
===== MID 1 =====												

	Chapter 3 Using High-Level Conceptual Data Models for Database Design, A Sample Database Application. Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types, Refining the ER Design for the COMPANY Database, ER Diagrams, Naming Conventions, and Design Issues, Relationship Types of Degree Higher than Two	1.5	4.5	1,2,5
	Chapter 8 Unary Relational Operations: SELECT and PROJECT Relational Algebra Operations from Set Theory Binary Relational Operations: JOIN and DIVISION Examples of Queries in Relational Algebra	1	3	1,2,5
	Chapter 14 Informal Design Guidelines for Relation Schemas Functional Dependencies/Normal Forms Based on Primary Keys General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form Multivalued Dependency and Fourth Normal Form Join Dependencies and Fifth Normal Form	2.5	7.5	2, 4, 6
	===== MID 2 =====			
	Chapter 20 Introduction to Transaction Processing Transaction and System Concepts Desirable Properties of Transactions Characterizing Schedules Based on Recoverability Characterizing Schedules Based on Serializability Transaction Support in SQL,  Chapter 21 Two-Phase Locking Techniques for Concurrency Control Concurrency Control Based on Timestamp Ordering	2	6	2,4,5,7

	Multiversion Concurrency Control Techniques Validation (Optimistic) Concurrency Control Techniques Granularity of Data Items and Multiple Granularity Locking			
	Chapter 22 Recovery Concepts NO-UNDO/REDO Recovery Based on Deferred Update Recovery Techniques Based on Immediate Update	<b>1.5</b>	<b>4.5</b>	<b>2,6,8</b>
	Chapter 24 Introduction to NOSQL Systems Document-Based NOSQL Systems and MongoDB NOSQL Key-Value Stores Column-Based or Wide Column NOSQL Systems			
	Review	<b>0.5</b>	<b>1.5</b>	<b>1,4,6,8</b>
	Project Presentations	<b>1</b>	<b>3</b>	<b>1,2,3,4,5,8</b>
	Total	<b>15</b>	<b>45</b>	
<b>Laboratory Projects/Experiments Done in the Course</b>				
<b>Programming Assignments Done in the Course</b>				
<b>Class Time Spent on (in credit hours)</b>	<b>Theory</b>	<b>Problem Analysis</b>	<b>Solution Design</b>	<b>Social and Ethical Issues</b>
	30	10	5	0
<b>Oral and Written Communications</b>	Every student is required to submit at least __1__ written reports of typically __2__ pages and to make __1__ oral presentations of typically __10__ minute's duration. Include only material that is graded for grammar, spelling, style, and so forth, as well as for technical content, completeness, and accuracy.			

**Instructor Name** \_\_Dr. Zulfiqar Ali Memon

**Instructor Signature** \_\_\_\_\_

**Date** \_\_September 7, 2020