Daffodil International University

Department of Computer Science and Engineering (CSE)

Course Outline

Course Code:	CSE 311				
Course Title:	Database Management System				
Program:	B.Sc. in Computer Science and Engineering				
Faculty:	Faculty of Science and Information Technology (FSIT)				
Semester:	Fall	**Year:**	2024		
Credit:	3.0	**Contact Hour:**	2.5 Hrs/Week		
Course Level:	L3-T1	**Prerequisite:**	CSE134, CSE221		
Course Category:	Core Engineering				
Instructor Name:	Mohammad Jahangir Alam				
Designation:	Assistant Professor				
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Course Content (from syllabus):
Overview of database management systems; Relational Data Model; Database Design and Normalization; SQL Basics; Advanced SQL Queries; Database Implementation; Database Security; Data Warehousing and Data Mining; NoSQL Databases; Distributed Databases; Database Administration; Big Data and Cloud Databases; Emerging Trends in Databases

Course Description/Rationale:
DBMS refers to an introductory course for understanding the fundamental concepts, principles, and techniques of database management systems. DBMS aims at the design, implementation and maintenance of relational databases, as well as various database models, query languages, normalization techniques, and database administration.

Course objective:

- Gain a foundational understanding of database management systems, including data models, normalization principles, and relational algebra.
- Develop proficiency in SQL for data manipulation, querying, and database schema definition.
- Learn to design and implement efficient relational databases using normalization techniques and proper schema design principles.
- Understand database security concepts and implement measures such as authentication, authorization, encryption, and auditing to protect data integrity and confidentiality.

- Explore advanced topics such as distributed databases, NoSQL databases, and data warehousing to understand emerging trends and technologies in the field.

Course Outcome (CO): at the end of the course, students will be able to:

CO1	demonstrate a comprehensive **understanding** of fundamental database management concepts, including the relational data model, normalization techniques, and SQL basics.
CO2	design, implement and optimize relational databases, incorporating advanced SQL queries, indexing techniques and query optimization strategies.
CO3	understand and analyze security measures, distributed database architectures and emerging trends in database management, demonstrating an understanding of the broader context and challenges in the field.

Content of the course:

Week	Course Content (as summary)	Hrs	COs
1	Introduction to Databases, Evolution of databases, Types of databases, Introduction to SQL	2.5	CO1
2	Discussion on Relational Data Model, Entity-Relationship (ER) modeling	2.5	CO1
3	Discussion on Relational algebra, Relational calculus	2.5	CO1
4	Discussion on Database Design and Normalization, Functional dependencies and normalization, Normal forms (1NF, 2NF, 3NF, BCNF), Denormalization	2.5	CO1, CO3
5	Discussion on SQL Basics, Data definition language (DDL), Data manipulation language (DML), Querying databases with CRUD Operations	2.5	CO1
6	Discussion on CRUD operations using SQL	2.5	CO2
7	Discussion on SQL Queries, Joins and subqueries, Set operations, Grouping and aggregation, Views and indexes	2.5	CO3
8	Discussion on Database Implementation, Storage and file structures, Indexing techniques, Query processing and optimization, Transaction processing	2.5	CO2
9	Discussion on Database Security, Security threats and vulnerabilities, Authentication and authorization, Encryption and access control, Auditing and monitoring	2.5	CO3
10	Discussion on Data Warehousing and Data Mining, Introduction to data warehousing, Data warehouse architecture, OLAP (Online Analytical Processing), Introduction to data mining techniques	2.5	CO1,CO3
11	Discussion on NoSQL Databases, Overview of NoSQL databases Types of NoSQL databases: document-oriented, key-value, column-family, graph, Use cases and applications	2.5	CO1

12	Discussion on Distributed Databases, Introduction to distributed databases, Distributed database architecture, Replication and fragmentation, Distributed query processing and optimization	2.5	CO1,CO2
13	Discussion on Database Administration, Database administration tasks and responsibilities, Backup and recovery, Performance tuning and optimization, Monitoring and troubleshooting	2.5	CO2
14	Discussion on Big Data and Cloud Databases, Introduction to big data technologies, Cloud computing and databases, Scalability and elasticity, Case studies and applications	2.5	CO3
15	Discussion on Emerging Trends in Databases, Blockchain and distributed ledger technology (DLT), Spatial and temporal databases, In-memory databases, Graph databases	2.5	CO3
16	Review of course materials, Project presentations and demonstrations, Future directions in database management	2.5	CO1,CO3
	Total	**40**	

Mapping of CO with PO's, TLA's, Blooms Domain, KP's, EP's and EA's

COs	POs	Teaching Learning Activity	Assessment Strategy	Blooms Taxonomy Domains and Levels	Knowledge Profile (WK)	Complex Engineering Problem (EP)	Complex Engineering Activity (EA)
CO1	PO1	TLA1	Quiz Assignment	C1	WK1	EP1 & EP2, EP3	-
CO2	PO3	TLA2	Midterm Final, Quiz	C4	WK5	EP1 & EP2, EP3	-
CO3	PO5	TLA3	Final, Quiz Presentation	C3	WK6	EP1 & EP2, EP6	-

Bloom's Taxonomy

Cognitive Domain

C2: Understand
C3: Apply
C4: Analyze
C5: Evaluate

Psychomotor Domain

P2: Manipulating
P3: Precising
P4: Articulating

Knowledge Profile

K2: Mathematics
K3: Engineering Fundamentals
K4: Specialist Knowledge
K5: Engineering Design
K6: Technology
K7: Society
K8: Research

Affective Domain

A2: Responding,
A3: Valuing,
A4: Organizing

Course Delivery Plan/Lesson Delivery Plan:

Week/Lesson (hour)	**Discussion Topic and Book Reference**	**Student Activities during Online and Onsite** [course teacher will decide based on the type of the contents]on the type of the contents]	**Mapping with CO and PO**	**Assessment Plan**
Week-1 Lesson 1 & 2 [3 Hours]	**Lesson 1:** Overview of database management systems, Evolution of databases Types of databases: relational, NoSQL, object-oriented **Lesson 2:** Introduction to SQL with Examples and exercises	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CO1 PO1	Class Test, Assignment, Midterm
Week-2 Lesson 3 & 4 [3 Hours]	**Lesson 3:** Relational model concepts Entity-Relationship (ER) modeling **Lesson 4:** Entity-Relationship (ER) modeling with Examples and exercises	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CO1 PO1	Class Test, Assignment, Midterm
Week-3 Lesson 5 & 6 [3 Hours]	**Lesson 5:** Relational algebra with Examples and exercises **Lesson 6:** Relational calculus with Examples and exercises	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CO1 PO1	Class Test, Assignment, Midterm
Week-4 Lesson 7 & 8 [3 Hours]	**Lesson 7:** Functional dependencies and normalization, Normal forms: 1NF, 2NF, **Lesson 8:** Normal forms: 3NF, BCNF, Denormalization, Practical	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CO1 PO1 CO3 PO5	Class Test, Assignment, Midterm

	database design considerations			
Week-5 Lesson 9 & 10 [3 Hours]	**Lesson 9:** Basic SQL syntax, Data definition language (DDL) **Lesson 10:** Data manipulation language (DML), Querying databases with SELECT	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CO1 PO1	Class Test, Assignment , Midterm
Week-6 Lesson 11 & 12 [3 Hours]	**Lesson 11:** Basic of CRUD Operations with Examples and exercises **Lesson 12:** Basic of CRUD Operations with Examples and exercises	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CO2 PO3	Class Test, Assignment , Midterm
Week-7 Lesson 13 & 14 [3 Hours]	**Lesson 13:** Joins and subqueries, Set operations **Lesson 14:** Grouping and aggregation, Views and indexes	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CO3 PO5	Class Test, Assignment , Midterm
Week-8 Lesson 15 & 16 [3 Hours]	**Lesson 15:** Storage and file structures, Indexing techniques **Lesson 16:** Query processing and optimization, Transaction processing	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CO2 PO3	Class Test, Assignment , Midterm
Week-9 Lesson 17 & 18 [3 Hours]	**Lesson 17:** Security threats and vulnerabilities, Authentication and authorization **Lesson 18:** Encryption and access control Auditing and monitoring	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CO3 PO5	Class Test, Assignment , Presentation , Final
Midterm Examination **Syllabus: Week 1 – Week 9**				

Week-10 Lesson 19 & 20 [3 Hours]	**Lesson 19:** Introduction to data warehousing, Data warehouse architecture OLAP (Online Analytical Processing) **Lesson 20:** Introduction to data mining techniques	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CO1 PO1 CO3 PO5	Class Test, Assignment , Presentation , Final
Week-11 Lesson 21 & 22 [3 Hours]	**Lesson 21:** Overview of NoSQL databases, Types of NoSQL databases: document-oriented **Lesson 22:** Types of NoSQL databases: key-value, column-family, graph; Use cases and applications	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CO1 PO1	Class Test, Assignment , Presentation , Final
Week-12 Lesson 23 & 24 [3 Hours]	**Lesson 23:** Introduction to distributed databases, Distributed database architecture **Lesson 24:** Replication and fragmentation, Distributed query processing and optimization	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CO1 PO1 CO2 PO3	Class Test, Assignment , Presentation , Final
Week-13 Lesson 25 & 25 [3 Hours]	**Lesson 25:** Database administration tasks and responsibilities, Backup and recovery **Lesson 26:** Performance tuning and optimization, Monitoring and troubleshooting	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CO2 PO3	Class Test, Assignment , Presentation , Final
Week-14 Lesson 27 & 28 [3 Hours]	**Lesson 27:** Introduction to big data technologies, Cloud computing and databases Scalability and elasticity **Lesson 28:**	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture	CO3 PO5	Class Test, Assignment , Presentation , Final

	Case studies and applications of Cloud Databases	note, Open discussion.		
Week-15 Lesson 29 & 30 [3 Hours]	**Lesson 29:** Blockchain and distributed ledger technology (DLT) **Lesson 30:** Spatial and temporal databases, In-memory databases, Graph databases	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CO3 PO5	Class Test, Assignment , Presentation , Final
Week-16 Lesson 31 & 32 [3 Hours]	**Lesson 31:** Review Class – 1: for preparing for the final exam **Lesson 32:** Review Class – 2: for preparing for the final exam Future Directions on DBMS	Brainstorming sessions, Classroom discussion, Voice over PPT, Lecture video, Lecture note, Open discussion.	CO1 PO1 CO3 PO5	Class Test, Assignment , Presentation , Final
Final Examination **Syllabus: Week 10 – Week 16**				

Assessment Pattern:

Assessment Task	CO's			Mark (Total=100)
	CO1	CO2	CO3	
Attendance	--	--	--	7
Class Test	--	--	--	15
Assignment	--	--	--	5
Presentation	--	--	--	8
Midterm Examination	5	10	10	25
Final Examination	5	15	20	40
Total Marks	10	15	15	100

CIE – Breakup [60 marks]

Bloom's Criteria	**Attendance (07)**	**Class Test (15)**	**Assignment (05)**	**Presentation (08)**	**Mid Exam (25)**
Remember		02			2.5
Understand		05	02	02	7.5

Apply		05		03	12.5
Analyze		03	03	03	2.5
Evaluate					
Create					

SEE – Semester End Examination [40 marks]

Bloom Criteria	Score for the Test
Remember	5
Understand	10
Apply	20
Analyze	5
Evaluate	
Create	

Learning Materials:
Textbook/Recommended Readings:

1. "Database System Concepts" by Abraham Silberschatz, Henry F. Korth, and S. Sudarshan
2. "Database Management Systems" by Raghu Ramakrishnan and Johannes Gehrke
3. "Database Design for Mere Mortals" by Michael J. Hernandez
4. "SQL Queries for Mere Mortals" by John L. Viescas and Michael J.
5. "SQL Cookbook" by Anthony Molinaro
6. Database Systems: The Complete Book" by Hector Garcia-Molina, Jeffrey D. Ullman, and Jennifer Widom

Reference Books/Supplementary Readings:

1. Online materials
2. Online resources using Google search engine, YouTube, etc.

Other Readings:

1. Powerpoint Lecture Slide Prepared by course teacher