



Navrachana University

## TEACHING PLAN

### Database Management System (CS237)

Faculty	Mrs. Sushma Vankhede			Division	B
Contact	sushmav@nuv.ac.in	Office Hours	10.00 AM to 6.00 PM		
School	School of Engineering and Technology				
Program	B.Tech Computer Science and Engineering				
Semester	Spring			Credits	3
Academic Year	2022-23				
Lecture time & Weekdays	16.00 to 17.00, Wednesday 15.00 to 16.00, Thursday 11.00 to 12.00, Friday	Location	507		
Pre-requisites	Introduction to Computer Programming, Data Structure				
Course Description	This course introduces students to basic database design and the use of databases in applications. Throughout the course students are introduced to Database and Database Management System, advantages and disadvantages of the different database models, comparison of relational model with the Structured Query Language (SQL); Understanding constraints and controversies associated with relational database model as well as the rules guiding transaction ACID. It includes the design using various diagrams like ER, Sequence, and Activity. The designed system will produce the ‘reports’ for specific queries.				
Course Abstract *	The Database Management System course introduce to get the knowledge regarding the database concepts. Also, it includes the database design to implementation of database based on real time problems.				
Course Objectives	1. To introduce fundamental concepts of DBMS 2. To design and create the Database model 3. To understand the Normalization techniques to reduce the data Redundancy. 4. To Learn the query processing system and transaction management and recovery techniques and managing transactions in database 5. To empower and expose the students with database implementation using SQL and PL/SQL languages.				
Learning Outcomes	1.Students will be able to understand the fundamental concepts of DBMS. 2. Students will be able to. apply analytical skills to map out the conceptual design for a real-life problem 3. Students will be able to improve the database design by normalization 4. Students will be able to evaluate the logical design to translate into a specific data model and physical design to meet system storage requirements. 5. Students will be able to evaluate Oracle features and Oracle related products for maintaining the integrity and performance of databases.				
Typology of Course	Theory/Project base.				
Course Outline (Units, Hours, Textbooks, Reference Books)	Unit I: Data and Information Data and Information: Limitations of Manual Data Processing, Advantages of DBMS over traditional computer file-based processing approach, Functions of DBA Elements of DBMS: DDL, DML, Entities, Sets and attributes. Data Base Tables: Keys - Primary, Secondary, Composite.  Unit II: Relational Model and Entity-Relationship Model				

	<p>Structure of relational databases, Domains, Relations, Relational algebra – fundamental operators and syntax, relational algebra queries. Entity Relationship model: Basic concepts, Design process, constraints, Keys, Design issues, E-R diagrams, weak entity sets, extended E-R features – generalization, specialization, aggregation, reduction to E-R database schema.</p> <p>Unit III: Relational Database Design Functional Dependency – definition, trivial and non-trivial FD, closure of FD set, closure of attributes, irreducible set of FD, Normalization – 1NF, 2NF, 3NF, Decomposition using FD-dependency preservation, BCNF, Multivalued dependency, 4NF, Join dependency and 5NF.</p> <p>Unit IV: Query and Transaction Management Query Processing &amp; Query Optimization: Overview, measures of query cost. Transaction Management: Transaction concepts, properties of transactions, serializability of transactions, testing for serializability, System recovery, Two Phase Commit protocol, Recovery and Atomicity, Log-based recovery, concurrent executions of transactions and related problems, locking mechanism, solution to concurrency related problems, deadlock, two-phase locking protocol, Isolation, Intent locking.</p> <p>Unit V: SQL and PL/SQL Concepts SQL Concepts: Basics of SQL, DDL, DML, DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator, aggregate functions, Built-in functions –numeric, date, string functions, set operations, sub-queries, correlated sub-queries, join, Exist, Any, All, view and its types., transaction control commands. PL/SQL Concepts: Cursors, Stored Procedures, Stored Function, Database Triggers.</p>
Pedagogy	This course will be based on Project based learning, in which students will be assigned course project in which they need to apply the knowledge gained during the theoretical and practical sessions. Also, there will be flip class-room method will be applied where students will give presentation on allotted topics
Expectations from Students *	1) Maintain silence in class. 2) Students should attend 100% classes. 3) Don't distract or harass others 4) Participate in class discussions 5) Turn in and do well in Assignments/Homework 6) Demonstrate in class presentation/discussions 7) Pass in Midterm and Final exam 8) Arrive to class on time 9) Maintain 80% attendance (minimum) 10) No plagiarism at all 11) Come prepared to class
Assessment / Evaluation	Quiz-1: 15 Marks (01/02/2022) Quiz-2: 15 Marks (19/04/2022) Assignment-I: 15 Marks (15/02/2022) Assignment-II: 15 Marks (20/04/2022) Presentation: 20 Marks (13/02/2022 to 21/04/2022) Viva: 20 Marks (17/04/2022 to 05/05/2022) Note: Above mention dates are tentative dates.
Attendance Policy	Students should attend 80% classes.
Project / Assignment Details *	Students should identify the problem definition and design Web application as course project.
Course Material	<b>Text Books:</b> 1. An introduction to Database Systems by C J Date -Wesley.

	<p>2. Database System Concepts by Abraham Silberschatz, Henry F. Korth &amp; S. Sudarshan - McGraw Hill.</p> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Understanding SQL by Martin Gruber, - BPB</li> <li>2. MySQL(TM): The Complete Reference by Vikram Vaswani.</li> <li>3. ORACLE PL/SQL by example. Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rd</li> </ol> <p><b>Learning Websites:</b></p> <ol style="list-style-type: none"> <li>1. <a href="https://docs.oracle.com/en/database/index.html">https://docs.oracle.com/en/database/index.html</a></li> <li>2. <a href="https://docs.oracle.com/en-us/iaas/mysql-database/doc/getting-started-mysql-database-service.html">https://docs.oracle.com/en-us/iaas/mysql-database/doc/getting-started-mysql-database-service.html</a></li> <li>3. <a href="https://www.oracle.com/in/database/technologies/appdev/plsql.html">https://www.oracle.com/in/database/technologies/appdev/plsql.html</a></li> </ol>
Additional Information *	This is core course.

### Session Plan

Topic Title	Session No.	Topic & Subtopic Details	Readings, Cases, etc.	Activities*	Important Dates
Data and Information	1	Introduction to DBMS, Terminologies: data, database, DBMS, DBS			
	2	DBS requirements from DBMS, Limitations of Manual Data Processing over DBMS			
	3	Advantages of DBMS over traditional computer file-based processing approach			
	4	View of Data: 3- tier architecture, instances and schemas, introduction to relational model, field, record,			
	5	Data Independence , DBMS users			
	6	Functions of DBA Functions of DBA Elements of DBMS: DDL, DML, Entities, Sets and attributes. Data Base Tables: Keys - Primary, Secondary, Composite.			
	7	DBMS storage structures: Primary memory, secondary memory, Media			
Relational Model and Entity Relationship Model	8	Introduction to data models, Structure of relational databases, Domains, Relations,			
	9	Relational algebra – fundamental operators and syntax,			
	10	relational algebra queries.			
	11	Tuple Relational Calculus and Domain Relational Calculus			
	12	ER- model,E-R diagram elements			
	13	Associative entity, Generalization and Specialization			
	14	Participation constraints, limitations and advantages of ER model.			
	15	Reduction of E-R model to relational schema.			

	16	Case study examples			
	17	Case study examples			
Relational Database Design	18	Functional Dependency – definition, trivial and non-trivial FD,			
	19	closure of FD set, closure of attributes, irreducible set of FD,			
	20	Normalization – 1NF, 2NF, 3NF			
	21	Decomposition using FD dependency preservation			
	22	Normalization – BCNF, Multivalued dependency			
	23	Normalization – 4NF, Join dependency			
	24	Normalization – 5NF			
Query Processing and Transaction Management	25	Query Processing & Query Optimization: Overview, measures of query cost.			
	26	Transaction Concept, ACID properties			
	27	Transaction Processing, States of transaction			
	28	DBMS Schedule			
	29	Concurrency: Serializable, Concurrency: Non-serializable transactions			
	30	Deadlock: Avoidance and prevention, commit, rollback and save point in transaction			
	31	Locks – exclusive and shared locks			
	32	2 phase locking			
	33	Failure, Recovery and Atomicity			
	34	Log based recovery, Recovery with concurrent transactions			
SQL and PL/SQL Concepts	35	SQL Concepts: Basics of SQL, DDL, DML, DCL, TCL, DQL			
	36	DDL commands, DML commands			
	37	Data retrieval commands, GROUP BY & HAVING clauses			
	38	defining constraints – Primary key, foreign key, unique, not null, check			
	39	IN operator, aggregate functions, Built-in functions –numeric, date, string functions, set operations			
	40	Data from multiple tables: Joins, Subqueries, Exist, Any, All, view			
	41	Transaction Control Commands			
	42	Introduction to PLSQL Concepts			
	43	Stored Procedures, Stored functions			
	44	Cursor			
	45	Database Triggers			

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