



Department of Information Technology		LP: IT18305
B-E/B.Tech/M-E/M.Tech : B.Tech	Regulation: 2018	Rev. No: 01
PG Specialisation : --		Date:
Sub. Code / Sub. Name : IT18305- DATABASE SYSTEMS		23/08/2021
Unit : 1		

**RELATIONAL DATABASES**

**Unit Syllabus:** Purpose of Database System – Levels of Data Abstraction – Data Models– Database System Architecture, – Introduction to relational databases - Relational Model - Keys -- Relational Algebra – Relational Calculus - SQL fundamentals - Advanced SQL features- Triggers- Embedded SQL– Dynamic SQL - Database connectivity.

**Objective:**

- To understand the purpose of database systems and explore the fundamental and advanced features of SQL

Session No *	Topics to be covered	Ref	Teaching Aids
1	Purpose of Database System - Levels of Data Abstraction, <b>Database system environment</b>	1 - Ch 1 ; Pg 6-7 2 - Ch 1 ; Pg 3 - 9	PPT/ONLINE TOOLS
2	Data Models– Types of Data Models- Database System Architecture	1 - Ch 2 ; Pg 31 –36 2 - Ch 1 ; Pg 23 - 25	PPT/ONLINE TOOLS
3	Introduction to relational databases- Relational Model - Keys	1 - Ch 5 ; Pg 146-164 2 - Ch 2 ; Pg 39 - 46	PPT/ONLINE TOOLS
4	Relational Algebra – select, project, set theory, join, division	1 - Ch 8 ; Pg 239-265 2 - Ch 6 ; Pg 217-239 6 - Ch 4; Pg 165-184	PPT/ONLINE TOOLS
5	Relational Calculus – Tuple Relational Calculus, Domain Relational Calculus	1 - Ch 8 ; Pg 265-280 2 - Ch 6 ; Pg 239 - 248 6 - Ch 4; Pg 185-193	PPT/ONLINE TOOLS
6	SQL fundamentals- Overview of SQL, Basic structure of SQL Query, Basic operations, set operations, Aggregate Functions, Views	1 - Ch 6 ; Pg 177 - 203 2 - Ch 3 ; Pg 57-104	PPT/ONLINE TOOLS
7	Advanced SQL features- Triggers	2 - Ch 6 ; Pg 207 - 228 3 - Ch 5; Pg 168-171	PPT/ONLINE TOOLS
8	Embedded SQL– Dynamic SQL	1 - Ch 10 ; Pg 314-326 3 - Ch 6; Pg 187-194	PPT/ONLINE TOOLS
9	Database connectivity- JDBC	1 - Ch 10 ; Pg 326-335 3 - Ch 6; Pg 194-205	PPT/ONLINE TOOLS
Content beyond syllabus covered (if any): Views, <b>Database system environment</b>			

\* Session duration: 50 minutes



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Unit : II

## DATABASE DESIGN

**Unit Syllabus :** Entity-Relationship Model – E-R Diagrams – Motivation for normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's-, Non-loss Decomposition- First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form - Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

### Objective:

- To enable database design using E-R modeling and apply normalization techniques over it.

Session No *	Topics to be covered	Ref	Teaching Aids
10	Entity-Relationship Model	1 - Ch 3 ; Pg 60-92 2 - Ch 7; Pg 262-274	PPT/ONLINE TOOLS
11	E-R Diagrams- Specialization, Generalization <b>Enhanced ER model</b>	1 - Ch 4 ; Pg 107-120 2 - Ch 7; Pg 274-283	PPT/ONLINE TOOLS
12	Motivation for normal forms, dependency theory - functional dependencies	1 - Ch 14 ; Pg 461-474 2 - Ch 8; Pg 329-348 3 - Ch 5 ; Pg 82 - 83	PPT/ONLINE TOOLS
13	Armstrong's axioms for FD's-, Non-loss Decomposition	3 - Ch 5 ; Pg 83 - 88 6-Ch 6; Pg- 293-306	PPT/ONLINE TOOLS
14	First, Second Normal Forms	1 - Ch 14 ; Pg 477-483 3 - Ch 5 ; Pg 88 - 94	PPT/ONLINE TOOLS
15	Third Normal Forms -Dependency Preservation	1 - Ch 14 ; Pg 483-487 3 - Ch 19; Pg 94 - 96	PPT/ONLINE TOOLS
16	Boyce/Codd Normal Form	1 - Ch 14 ; Pg 187-191 3 - Ch 5 ; Pg 96 - 98	PPT/ONLINE TOOLS
17	Multi-valued Dependencies and Fourth Normal Form	1 - Ch 14; Pg 491-494 2 - Ch 7; Pg 355-360 3 - Ch 5 ; Pg 98-100	PPT/ONLINE TOOLS
18	Join Dependencies and Fifth Normal Form.	1 - Ch 14; Pg 494-495 3 - Ch 5 ; Pg 100-102	PPT/ONLINE TOOLS

Content beyond syllabus covered (if any): Specialization, Generalization, Enhanced ER model



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Unit - III

**TRANSACTION MANAGEMENT**

**Unit Syllabus:** Transaction Concepts - Transaction Recovery – ACID Properties – System Recovery – Media Recovery – Two Phase Commit – Save Points – Concurrency – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Recovery Isolation Levels.

**Objective:**

- To explore the concepts of transactions that happens in a database.

Session No *	Topics to be covered	Ref	Teaching Aids
19	Transaction Concepts- ACID Properties	1-Ch.20;Pg.746 – 758 2-Ch.14;Pg.627-632	PPT/ONLINE TOOLS
20	Transaction Recovery- Deferred update, Immediate update-	1-Ch.20;Pg.746 – 758 3-Ch.8;Pg.159-161	PPT/ONLINE TOOLS
21	System Recovery – Media Recovery	3-Ch.18;Pg.580-596	PPT/ONLINE TOOLS
22	Two Phase Commit-- Save Points	1-Ch.19;Pg.689-690 2-Ch.16;Pg.750-756	PPT/ONLINE TOOLS
23	Concurrency – Need for Concurrency	1-Ch.18;Pg.643-644	PPT/ONLINE TOOLS
24	Locking Protocols	1-Ch.18;Pg.644-654 2-Ch.15;Pg.661-666	PPT/ONLINE TOOLS
25	Two Phase Locking	1-Ch.18;Pg.644-654 2-Ch.15;Pg.667-673	PPT/ONLINE TOOLS
26	Deadlock	2-Ch.15;Pg. 674-679 3 - Ch 17; Pg 556-559	PPT/ONLINE TOOLS
27	Recovery Isolation Levels.	2-Ch.16;Pg.726-738	PPT/ONLINE TOOLS

Content beyond syllabus covered (if any):

\* Session duration: 10 minutes



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Unit : IV

#### IMPLEMENTATION TECHNIQUES

**Unit Syllabus :** Overview of Physical Storage Media – RAID – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Evaluation of relational algebra expressions, query equivalence, join strategies, query optimization algorithms.

#### Objective:

- To understand the underlying data structures used in for real world applications and optimize query execution.

Session No *	Topics to be covered	Ref	Teaching Aids
28	Overview of Physical storage media- Magnetic Disks	1-Ch.13;Pg.547-556 2-Ch.10;Pg.429-441	PPT/ONLINE TOOLS
29	RAID- Tertiary Storage	1-Ch.16;Pg.584-588 2-Ch.10;Pg.441-449	PPT/ONLINE TOOLS
30	File Organization	1-Ch.16;Pg.567-572 2-Ch.10;Pg.451-457	PPT/ONLINE TOOLS
31	Organization of records in files	1-Ch.16;Pg.560-564 2-Ch.10;Pg.457-462	PPT/ONLINE TOOLS
32	Indexing and Hashing- Ordered Indices- Primary, Secondary and clustered indices, Multilevel Indexes	1-Ch.17;Pg.602-616 2-Ch.11;Pg.475-485	PPT/ONLINE TOOLS
33	B+ - Tree Index files - B-Tree Index files	1-Ch.17;Pg.617-630 2-Ch.11;Pg.485-506	PPT/ONLINE TOOLS
34	Static hashing, Dynamic hashing	1-Ch.16;Pg.572-582 2-Ch.11;Pg.509-523	PPT/ONLINE TOOLS
35	Evaluation of relational algebra expressions, query equivalence, join strategies	1-Ch.18;Pg.655-688 2-Ch.12;Pg.537-571	PPT/ONLINE TOOLS
36	Query optimization algorithms.	1-Ch.19;Pg.691-737 2-Ch.13;Pg.579-598	PPT/ONLINE TOOLS

**Content beyond syllabus covered (if any):** Multilevel Indexes



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Unit : V

#### ADVANCED TOPICS

**Unit Syllabus :** NoSQL databases - Hbase, MongoDB, Cassandra, CouchDB, Neo4J, In-memory Database - Redis, Object Relation Map - Alkami, Distributed databases, Spatial Databases, Temporal Databases, XML Databases, Multimedia Databases

#### Objective:

- To get an exposure over the recent advancements in databases.

Session No *	Topics to be covered	Ref	Teaching Aids
37	NoSQL databases	1-Ch.24;Pg.883-909	PPT/ONLINE TOOLS
38	Hbase, MongoDB	<a href="https://www.tutorialspoint.com/hbase/index.htm">https://www.tutorialspoint.com/hbase/index.htm</a>	PPT/ONLINE TOOLS
39	Cassandra, CouchDB	<a href="https://www.tutorialspoint.com/cassandra/index">https://www.tutorialspoint.com/cassandra/index</a>	PPT/ONLINE TOOLS
40	Neo4J, In-memory Database - Redis	<a href="https://neo4j.com/developer/opst/get-started/">https://neo4j.com/developer/opst/get-started/</a>	PPT/ONLINE TOOLS
41	Object Relation Map - Alkami	2-Ch.22;Pg.945-975	PPT/ONLINE TOOLS
42	Distributed databases	1-Ch.23;Pg.841-876 2-Ch.19;Pg.825-875	PPT/ONLINE TOOLS
43	Spatial Databases and Temporal Databases	1-Ch.26;Pg.974-994 2-Ch.25;Pg.1061-1076	PPT/ONLINE TOOLS
44	XML Databases	2-Ch.23;Pg.981-1019	PPT/ONLINE TOOLS
45	Multimedia Databases	1-Ch.26;Pg.994-999	PPT/ONLINE TOOLS

Content beyond syllabus covered (if any):

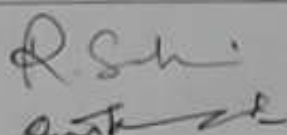
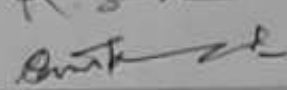

\* Session duration: 50 mins



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### REFERENCES:

1. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Seventh Edition, Pearson Education, 2016.
2. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, Database System Concepts, Sixth Edition, Tata McGraw Hill, 2010.
3. Raghu Ramakrishnan, Johannes Gehrke Database Management Systems, Fourth Edition, Tata McGraw Hill, 2010.
4. G.K.Gupta, Database Management Systems, Tata McGraw Hill, 2011.
5. Carlos Coronel, Steven Morris, Peter Rob, Database Systems: Design, Implementation and Management, Ninth Edition, Cengage Learning
6. Bipin Desai, An Introduction to Database Systems, Galgotia .
7. Pang, N. T., Steinbach, M. and Kumar, V., "Introduction to Data Mining", Pearson Education

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Remarks* :		

\* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD