FR. Conceicao Rodrigues College Of Engineering

Father Agnel Ashram, Bandstand, Bandra-west, Mumbai-50

Department of Information Technology

T.E. (IT) (semester V) (2020-2021)

Lesson Plan

Subject: Advanced Database Management Technologies(TE ITC503)

Credits-4

SYLLABUS

Sr. No.	Module	Detailed Content	CO Mapping
00	Prerequisite	Reviewing basic concepts of a Relational database, SQL concepts	
01	Query Processing and Optimization:	Overview, Measures of Query Cost Selection Operation, Sorting, Join Operation, Other Operations Evaluation of Expressions. Query Optimization Overview, Transformation of Relational Expressions Estimating Statistics of Expression Results Choice of Evaluation Plans	CO1
02	Transactions Management and Concurrency:	Transaction concept, Transaction states, ACID properties, Implementation of atomicity and durability, Concurrent Executions, Serializability, Recoverability, Implementation of isolation, Concurrency Control: Lock-based, Time-stamp based Deadlock handling, Recovery System: Failure Classification, Storage structure, Recovery & atomicity, Log based recovery, Checkpoints, Shadow Paging, ARIES Algorithm.	CO2
03	Advanced Data Management techniques	Advanced Database Access protocols: Discretionary Access Control Based on Granting and Revoking Privileges; Mandatory Access Control and Role-Based Access Control. Overview of Advanced Database models like Mobile databases, Temporal databases, Spatial databases.	CO3 CO4
04	Distributed Databases	Introduction : Distributed Data Processing, What is a Distributed Database System? Design Issues .	CO4

		Distributed DBMS Architecture. Distributed Database Design : Top-Down Design Process, Distribution Design Issues, Fragmentation , Allocation . Overview of Query Processing : Query Processing Problem, Objectives of Query Processing, Complexity of Relational Algebra Operations, Characterization of Query Processors, Layers of Query Processing, Query Optimization in Distributed Databases; Overview of Transaction Management in DDB; Overview of Concurrency Control in DDB; Overview of Recovery in DDB	
05	Data Warehousing, Dimensional Modeling and OLAP	The Need for Data Warehousing; Data Warehouse Defined; Benefits of Data Warehousing ; Features of a Data Warehouse; Data Warehouse Architecture; Data Warehouse and Data Marts; Data Warehousing Design Strategies. Dimensional Model Vs ER Model; The Star Schema; How Does a Query Execute? The Snowflake Schema; Fact Tables and Dimension Tables; Factless Fact Table; Updates To Dimension Tables, Primary Keys, Surrogate Keys & Foreign Keys; Aggregate Tables; Fact Constellation Schema or Families of Star Need for Online Analytical Processing; OLTP vs OLAP; OLAP Operations in a cube: Roll-up, Drilldown, Slice, Dice, Pivot ; OLAP Models: MOLAP, ROLAP, HOLAP.	CO5
06	ETL Process	Challenges in ETL Functions; Data Extraction; Identification of Data Sources; Immediate Data Extraction, Deferred Data Extraction; Data Transformation: Tasks Involved in Data Transformation, Techniques of Data Loading, Loading the Fact Tables and Dimension Tables	CO6

Text Books:

1. Korth, Slberchatz,Sudarshan, :"Database System Concepts", 6th Edition, McGraw – Hill
2. Elmasri and Navathe, "Fundamentals of Database Systems", 6th Edition, PEARSON Education.
3. Theraja Reema, "Data Warehousing", Oxford University Press, 2009.

4. Raghu Ramakrishnan and Johannes Gehrke, “Database Management Systems” 3rd Edition - McGraw Hill

References:

1. Paulraj Ponniah, “Data Warehousing: Fundamentals for IT Professionals”, Wiley India.
2. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom “Database System Implementation”, Pearson Ltd. 1/ e
3. Thomas M. Connolly Carolyn Begg, Database Systems : A Practical Approach to Design, Implementation and Management, 4/e, Pearson Ltd.
4. Ralph Kimball, Margy Ross, “The Data Warehouse Toolkit: The Definitive Guide To Dimensional Modeling”, 3rd Edition. Wiley India.
5. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann 3nd Edition.

Internal Assessment for 20 marks:
Consisting of **Two Compulsory Class Tests**
Approximately 40% to 50% of syllabus content must be covered in First test and remaining 40% to 50% of syllabus contents must be covered in second test.

CO-Statements:

Sr.No.	Course Outcome Statement
TEITC503.1	Explain and understand the concept of a transaction and how ACID properties are maintained when concurrent transactions occur in database.
TEITC503.2	Measure query cost and design alternate efficient paths for query execution.
TEITC503.3	Apply sophisticated access protocols to control access to the database
TEITC503.4	Implement alternate models like distributed databases and design applications using advanced models like mobile, spatial databases.
TEITC503.5	Organize strategic data in an enterprise and build a data Warehouse.
TEITC503.6	Analyze data using OLAP operations so as to take strategic decisions.

CO-PO-PSO Mapping

Course Name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO1	PSO2
CO1	2	1												2
CO2	2	1			1								1	2
CO3	2				1								1	1
CO4	2				1									2
CO5	1	1	2		1								1	2
CO6	1	1	2		1								1	2

CO Assessment Tools

		Direct Methods							Indirect Methods
	Test1	**Assig1**	**Quiz**	**Lab Work**	**Test2**	**Assig2**	**University Theory Exam**	**University Oral Exam**	Course Exit Survey
CO1	20%	10%	**15%**	**15%**			**20%**	20%	100%
CO2	20%	20%		**15%**			**20%**	25%	100%
CO3			25%		30%		**20%**	25%	100%
CO4			**20%**	**20%**	20%		**20%**	20%	100%
CO5			**20%**	**10%**	**25%**		**20%**	25%	100%
CO6			**20%**	**10%**	**25%**		**20%**	25%	100%

Content beyond syllabus

Information Package diagram

Lecture Plan:

Lecture no	Topic	Planned date	Actual Date	Mode of teaching
1	Review of basic concepts of a Relational database, SQL concepts,	13-7	13-7	Online –Google Meet
2.	Indexing	14-7	14-7	Online –Google Meet
3.	Query Processing	15-7	15-7	Online –Google Meet
4	Complex Selection Cost	16-7	16-7	Online –Google Meet
5	Sorting and Internet Issue	20-7	20-7	Online –Google Meet
6	External Merge Sort, Nested Loop Join	21-7	21-7	Online –Google Meet
	Block, Indexed Nested Loop Join, Merge Join	22-7	22-7	Online –Google Meet

7	Hash Index, Hash Join	23-7	23-7	Online –Google Meet
8	Outer Joins, Query Evaluation - Materialization, Pipelining	27-7	27-7	Online –Google Meet
9	Query Optimization	**28-7**	**28-7**	Online –Google Meet
10	Query Optimization, Equivalent expression Estimating statistics of Expression Results	29-7	29-7	Online –Google Meet
11	Statistics for Cost Estimation	30-7	30-7	Online –Google Meet
12	Cost Based Optimization	3-8	4-8	Online –Google Meet
13	Transaction Management Start	4-8	5-8	Online –Google Meet
14	Serializability	5-8	6-8	Online –Google Meet
15	Conflict and View Serializability	6-8	10-8	Online –Google Meet
16	Recoverable Schedules, Locking Protocols	10-8	11-8	Online –Google Meet
17	Lock Based Protocol - Shared, Exclusive, Problems	11-8	**13-8**	Online –Google Meet
18	2 phase locking protocol	**13-8**	17-8	Online –Google Meet
19	2-Phase Locking, Lock Conversions, Lock Table, TimeStamp Based Protocol	17-8	18-8	Online –Google Meet
20	TimeStamp Based Protocol Example, Problems, Thoms's Write Rule	18-8	19-8	Online –Google Meet
21	Deadlock Recovery, Types of Failures	19-8	20-8	Online –Google Meet
22	Recovery Mechanisms, Log Based Recovery	20-8	31-8	Online –Google Meet
23	Deferred, Immediate Log Based Recovery	31-8	1-9	Online –Google Meet
24	Checkpoints, ARIES Start	1-9	2-9	Online –Google Meet
25	ARIES Analysis Phase Complete	2-9	**3-9**	Online –Google Meet
26	**Aries Algorithm , Example Solved**	**3-9**	7-9	Online –Google Meet
27	Distributed DataBase Systems	7-9	**8-9**	Online –Google Meet
28	**Distributed Database System Issues, types of Data Fragmentation**	**8-9**	**9-9**	Online –Google Meet
29	**Types of Distributed database systems, Query processing in distributed system**	**9-9**	**10-9**	Online –Google Meet
30	**Revision for Query processing and Transaction Management**	**10-9**	22-9	Online –Google Meet
31	Query processing in distributed systems	**21-9**	23-9	Online –Google Meet
32	Concurrency control and recovery in DDB	22-9	24-9	Online –Google Meet
33	**Concurrency control and recovery in DDB, Introduction to Data Warehousing**	23-9	28-9	Online –Google Meet

34	Data warehouse features and Data warehouse Architecture	24-9	29-9	Online –Google Meet
35	OLAP Operations in a cube: Rollup, Drilldown, Slice, Dice, Pivot	28-9	30-9	Online –Google Meet
36	OLAP Operations in a cube: Rollup, Drilldown, Slice, Dice, Pivot	29-9	1-10	Online –Google Meet
37	OLAP Models: MOLAP, ROLAP, HOLAP.	30-9	5-10	Online –Google Meet
38	Challenges in ETL Functions; Data Extraction; Identification of Data Sources; Immediate Data Extraction, Deferred Data Extraction;	1-10	6-10	Online –Google Meet
39	Data Transformation: Tasks Involved in Data Transformation,Techniques of Data Loading, Loading the Fact Tables and DimensionTables	5-10	7-10	Online –Google Meet
40	Advanced Database Access protocols: Discretionary Access Control Based on Granting and Revoking Privileges;	6-10	8-10	Online –Google Meet
41	Discretionary Access Control Based on Granting and Revoking Privileges;	7-10	12-10	Online –Google Meet
42	Mandatory Access Control,	8-10	13-10	Online –Google Meet
43	Role based Access control	12-10	14-10	Online –Google Meet
44	Overview of Advanced Database models like Mobile databases,	13-10	15-10	Online –Google Meet
45	Temporal databases, Spatial databases	14-10	19-10	Online –Google Meet
46	Revision	15-10	20-10	Online –Google Meet

Lab Plan for OLAP Lab

Lab Outcomes:

LO1 -Implement simple query optimizers and design alternate efficient paths for query execution**.**
LO2-Simulate the working of concurrency protocols, recovery mechanisms in a database
LO3-Design applications using advanced models like mobile, spatial databases**.**
LO4-Implement query processing and transaction processing mechanisms.

LO5- Design Star schema, Snowflake schema and Fact constellation Schema.
LO6- Analyze data using OLAP operations so as to take strategic decisions

Lab Plan: ADMT

Sr. No	Topic	Date	Lab outcome
1	To execute complex SQL queries in Posgresql	21-10	
2	To implement cost estimation for different Join operations	22-10	LO1,CO2
3	To implement query cost optimization	22-10	LO1,CO1
4	To implement concurrency control algorithm	26-10	LO2,CO1
5	To implement ARIES recovery algorithm	27-10	LO2,CO2
6	To implement Query Processing for distributed Databases	28-10	LO4,CO4
7	To implement Data Fragmentation	**29-10**	LO4,CO4
8	Case study on Data warehouse construction	2-11	LO5,CO5
9	Implementation of OLAP queries	3-11	LO6,CO6
10	Case study on Mobile, Temporal and Spatial databases		LO3,CO3

Rubrics for assessment of Lab:

Indicator	Below Expectations	Meet Expectations	Exceeds Expectations
Timeline (2)	More than two session late (0)	one sessions late (1)	Early or on time (2)
Preparedness (2)	Not aware of the theory to the point. (1)	Managed to explain the theory related to the experiment. (1)	Knows the basic theory related to the experiment very well. (2)
Effort (3)	Just managed. (1)	Done expt with help from other. (2)	Done expt on their own. (3)
Documentation (2)	Experiments not written in proper format (0.5)	Documented in proper format but some formatting guidelines are missed. (1)	Lab experiment is documented in proper format and maintained neatly. (2)
Results(1)	Not specific at all. (0)	Partially specific conclusion. (0.5)	Specific conclusion.(1)

Assignment Plan:

Assignment No	Date	Questions	CO/LO
1	**8/8/2020**		**CO1**
2	**16/9/2020**		**CO2**

Rubrics for assessment of Assignment:

Indicator	Below Expectations	Meet Expectations	Exceeds Expectations
Timeline (2)	More than one session late (0)	One sessions late (1)	On time (2)
Level of content (4)	Major points are addressed minimally (2)	Only major topics are covered(3)	Most major and some minor criteria are included. Information is Adequate (4)
Reading and Understanding (4)	Superficial at most (2)	Understood concepts but no related topics (3)	Understood concepts and related topics (4)

Quiz Conducted:

Quiz No.	Date	Topic	CO/LO
1	**8/9/2020**	**Transaction Management**	**CO1**
2	**22/11/2020**	**Distributed Databases**	**CO4**
3	**23/11/2020**	**Data warehouse and OLAP**	**CO5**
4	**24/11/2020**	**ETL Process**	**CO6**
5	**24/11/2020**	**Adv. Database security and Data Models**	**CO3, CO4**

SEPM CO Attainment : 2020-21

CO	Attainment
CO1	2.6
CO2	2.84
CO3	2.84
CO4	2.84
CO5	2.76
CO6	2.84

ADMT: 2019-20
attainment

CO	Attainment
CO1	2.52
CO2	2.28
CO3	2.76
CO4	2.6
CO5	2.44
CO6	2.12

Term Work:
Term Work shall consist of at least 10 to 12 practical's based on the above list. Also Term work Journal must include at least 2 assignments.
Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)
Oral Exam: An Oral exam will be held based on the above syllabus.