GUJARAT TECHNOLOGICAL UNIVERSITY
Syllabus for Integrated MSc, 8th Semester
Branch: Information Technology
Subject Name: Advanced Database Systems
Subject Code: 1380502

Teaching and Examination Scheme

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE(E)	PA (M)	PA (I)	ESE(V)	
3	0	2	4	70	30	20	30	150

Content:

Sr. No.	Content	Teaching Hours	Module Weightage (%)
1	**Relational Databases:-** Introduction - Purpose of Database System – Database System Applications - View of data: Data Abstraction, Instances and Schemas, Database Users and Administrators: Database Users and Interfaces, DBA, Structure of Relational Database, database Schema, Keys, Relational Query language – The Relational Algebra: Fundamental Operations, Formal definition of the relational algebra, The EntityRelationship model: Entity Set, Relationship Set, E-R Diagrams: Basic structure, Complex attributes, Roles, Non binary relationship sets, Weak Entity Set, Relational Database Design using ER- to Relational Mapping – Extended ER Features: Specialization, Generalization, Attribute inheritance, Constraints on generalization, Aggregation.	9	15%
2.	**Database Design:-** Database Tables and Normalization – The Need for Normalization – The Normalization Process: Inference Rules for Functional Dependencies - Minimal set of Functional Dependencies - Conversion to First Normal Form, Conversion to Second Normal Form, Conversion to Third Normal Form - Improving the Design - Surrogate Key Considerations - Higher Level Normal Forms: Boyce/Codd Normal Form, Fourth Normal Form, Join dependencies and Fifth Normal Form – Normalization and Database Design	7	20%
3.	Transaction Management and Concurrency Control:- Transaction: Evaluating Transaction Results, Transaction Properties, Transaction Management with SQL, The Transaction Log – Concurrency Control: Lost Updates, Uncommitted Data, Inconsistent Retrievals, The Scheduler – Concurrency Control with Locking Methods: Lock Granularity, Lock Types, Two Phase Locking to Ensure	8	25%

	Serializability, Deadlocks – Concurrency Control with Timestamping Methods: Wait/Die and Wait/Wound Schemes – Concurrency Control with Optimistic Methods - Database Recovery Management: Transaction Recovery.		
4.	Data Storage and Querying:- RAID – File Organization – Organization of Records in Files – Indexing and Hashing: Basic concept, Ordered Indices, B+ tree Index Files: Structure of a B+- Tree (structure only, algorithms not needed) - B tree index files – Static Hashing – Dynamic Hashing – Query Processing: Overview - Selection Operation.	7	15%
5.	System Architecture, Object Oriented Databases, XML and NoSQL:- Distributed Databases: Homogeneous and Heterogeneous Databases, Distributed Data Storage, Distributed Transactions - Object Based Databases: Overview, Complex Data types, Structured types and inheritance in SQL, Table Inheritance, Array and Multiset types in SQL, Object identity and reference types in SQL - XML: DTD and XML Schema, XML presentation, XML Applications - Next Generation Databases: Distributed Relational Databases – Non relational Distributed Databases	9	25%

Reference Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan," Database System Concepts", McGraw Hill Education, 6th Edition, 2011.
2. Ramez Elmasri, Shamkant B.Navathe, "Fundamentals of Database Systems ", Pearson Education, 5th Edition, 2007
3. Guy Harrison, "Next Generation Databases: NoSQL, NewSQL, and Big Data", Apress, 1st Edition, 14 December 2015.
4. Rob, Peter and Carlos Coronel, "Database Principles: Fundamentals of Design, Implementation and Management", 9th Edition, 2011.
5. Ashutosh Kumar Dubay, "Database Management Concepts", S.K. Kataria & Sons, 1st Edition (2012).
6. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", McGraw Hill, 3rd Edition (2014).
7. Thomas M Connolly and Carolyn E Begg, "Database systems- A Practical Approach to Design, Implementation and Management", Pearson Education, 4th Edition (2014).

Course Outcome:

After learning the course, the students should be able to:

No.	CO statement
CO-1	Examine why databases are important. Also, describe the basic features of the relational data model and discuss their importance to the end user and the designer.
CO-2	Evaluate and design good table structures to control data redundancies and anomalies.
CO-3	Explain the database transaction and its properties, describe concurrency control, and analyze the role it plays in maintaining the database integrity.
CO-4	Discuss the various disk-organization techniques and describe the various data structures that allow fast access to data.
CO-5	Analyze the concept of object-oriented databases and distributed databases. Explain the concept of XML and Describe the various NoSQL databases.