**FR. Conceicao Rodrigues College Of Engineering**

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

**Department of Information Technology**

**S.E. (IT) (semester III)  (2019-2020)**

**Lesson Plan**

**Subject: Database Management System(ITC304)**

**Credits-4**

SYLLABUS

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr.**  **No.** | **Module** | **Detailed Content** | **CO**  **Mapping** |
| 00 | Introduction  Database  Concepts | Introduction, Characteristics of  databases, File system V/s Database  system, Users of a Database system  Data Models, Schemas, and Instances,  Three-Schema Architecture and Data  Independence, Database Administrator  (DBA), Role of a DBA |  |
| 01 | Entity–  Relationship  Data Model | Conceptual Modeling of a database,  The Entity-Relationship (ER) Model,  Entity Types, Entity Sets, Attributes,  and Keys, Relationship Types,  Relationship Sets, Weak Entity Types  Generalization, Specialization and  Aggregation, Extended Entity-  Relationship (EER) Model. | CO1 |
| 02 | Relational Model  and Relational  Algebra | 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 | Introduction to Relational Model,  Relational Model Constraints and  Relational Database Schemas, Concept  of Keys: Primary Kay, Secondary key,  Foreign Key, Mapping the ER and EER  Model to the Relational Model,  Introduction to Relational Algebra,  Relational Algebra expressions for   Unary Relational Operations,   Set Theory operations,   Binary Relational operation  Relational Algebra Queries | CO2 |
| 04 | Structured Query  Language (SQL) | Overview of SQL , Data Definition  Commands, Set operations , aggregate  function , null values, , Data  Manipulation commands, Data Control  commands , Views in SQL, Complex  Retrieval Queries using Group By,  Recursive Queries, nested Queries ;  Referential integrity in SQL. Event  Condition Action (ECA) model  (Triggers) in SQL; Database  Programming with JDBC, Security  and authorization in SQL Functions  and Procedures in SQL and cursors. | CO3,CO4 |
| 05 | Relational–  Database Design | Design guidelines for relational  schema, Functional Dependencies,  Definition of Normal Forms- 1NF,  2NF, 3NF, BCNF, Converting  Relational Schema to higher normal  forms. | CO5 |
| 06 | Storage and  Indexing | Operation on Files; hashing  Techniques; Types of Indexes: Single-  Level Ordered Indexes; Multilevel  Indexes; Overview of B-Trees and B+-  Trees; Indexes on Multiple Keys. | CO6 |

**Text Books:**

1. SQL The Complete Reference, 3rd Edition , James R Groff, Paul N. Weinberg, Andy Oppel,

McGraw Hill.

**2.** G. K. Gupta :”Database Management Systems”, McGraw – Hill

**References:**

1. Korth, Slberchatz,Sudarshan, :”Database System Concepts”, 6th Edition, McGraw – Hill

2. Raghu Ramkrishnan and Johannes Gehrke, “ Database Management Systems”, TMH

**Internal Assessment**

**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:**

**At the end of the course students will be able to:**

|  |  |
| --- | --- |
| **Sr.No.** | **Course Outcome Statement** |
| SEITC304.1 | Explain the features of database management systems and Relational database |
| SEITC304.2 | Design conceptual models of a database using ER modeling for real life applications and also construct queries in Relational Algebra |
| SEITC304.3 | Create and populate a RDBMS for a real life application, with constraints and keys, using SQL. |
| SEITC304.4 | Retrieve any type of information from a data base by formulating complex queries in SQL. |
| SEITC304.5 | Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database. |
| SEITC304.6 | Build indexing mechanisms for efficient retrieval of information from a database |

**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 |  |  |  |  |  |  | 3 | 1 |  |
| CO2 |  | 2 | 3 |  | 2 |  |  |  | 2 | 2 |  | 2 | 1 | 1 |
| CO3 | 1 |  |  | 3 | 2 |  |  |  |  |  |  |  |  | 1 |
| CO4 | 1 |  |  | 3 | 2 |  |  |  |  |  |  |  |  | 1 |
| CO5 |  | 2 | 3 | 1 |  |  |  |  |  |  |  | 2 | 1 |  |
| CO6 | 2 |  | 1 | 1 |  |  |  |  |  |  |  | 1 | 1 | 1 |

**CO Assessment Tools**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | **Direct Methods** | | | | | | | **Indirect Methods** | |
|  | **Test1** | **Assig1** | | **Lab Work** | **Test2** | **Assig2** | **University Theory Result** | **University Oral Result** | **MCQ** | Course Exit Survey |
| CO1 | **30%** | **30%** | | **10%** | **-** | **-** | **20%** | **10%** | **-** | **100%** |
| CO2 | **30%** | **30%** | | **10%** | **-** | **-** | **10%** | **20%** | **-** | **100%** |
| CO3 | **20%** | **20%** | | **40%** |  |  | **10%** | **10%** | **-** | **100%** |
| CO4 | **-** | **-** | | **10%** | **30%** | **20%** | **30%** | **10%** | **-** | **100%** |
| CO5 | **-** | **-** | | **20%** | **30%** | **20%** | **20%** | **10%** | **-** | **100%** |
| CO6 | **-** | **-** | | **10%** | **30%** | **20%** | **20%** | **20%** | **-** | **100%** |

**Lecture Plan:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Lecture no | Topic | Planned date | Actual Date | Mode of teaching |
| 1 | Introduction to database, Characteristics of databases, File system V/s Database System | 1/7/19 | 1/7/19 | Black board and chalk |
| 2 | Users of Database System, Data Models, | 2/7/19 | 5/7/19 | Black board and chalk |
| 3 | Schemas and Instances, Three Level Schema | 5/7/19 | 8/7/19 | Black board and chalk |
| 4 | Architecture and Data Independence, Database Administrator (DBA), Role of DBA | 8/7/19 | 9/7/19 | Black board and chalk |
| 5 | Data Independence, Database Administrator (DBA), Role of DBA | 9/7/19 | 12/7/19 | Black board and chalk |
| 6 | Conceptual Modeling of a database, E-R Model, Entity Types, Entity Sets | 12/7/19 | 17/7/19 | Black board and chalk |
| 7 | Attributes and Keys, | 15/7/19 | 18/7/19 | Black board and chalk |
| 8 | Relationship Types, Relationship Sets, | 17/7/19 | 19/7/19 | Black board and chalk |
| 9 | Weak Entity Types | 18/7/19 | 22/7/19 | Black board and chalk |
| 10 | Generalization, Specialization and Aggregation, | 19/7/19 | 24/7/19 | Black board and chalk |
| 11 | EER Model | 22/7/19 | 25/7/19 | Black board and chalk |
| 12 | Introduction to Relational Model, Relational Model Constraints, and Relational Database Schemas | 24/7/19 | 26/7/19 | Black board and chalk |
| 13 | Concept of Keys: Primary key, Secondary Key, Foreign Key | 25/7/19 | 29/7/19 | Black board and chalk |
| 14 | Mapping the ER and EER, Model to the Relational Model | 26/7/19 | 31/7/19 | Black board and chalk |
| 15 | Mapping the ER and EER, Model to the Relational Model | 29/7/19 | 1/8/19 | Black board and chalk |
| 16 | Introduction to Relational Algebra, | 31/7/19 | 2/8/19 | Black board and chalk |
| 17 | Relational Algebra Expressions for   * Unary Relational Operations * Set Theory Operations   Binary Relational Operation | 1/8/19 | 7/8/19 | PPT, Black board and chalk |
| 18 | Relational Algebra Queries | 2/8/19 | 8/8/19 | Black board and chalk |
| 19 | Overview of SQL, Data Definition Commands, Set Operations | 5/8/19 | 9/8/19 | PPT, Black board marker |
| 20 | Set Operations, Aggregate Functions, | 7/8/19 | 19/8/19 | PPT, Black board marker |
| 21 | Null Values, Data Manipulation Commands, | 8/8/19 | 21/8/19 | Black board and chalk |
| 22 | Data Control Commands | 9/8/19 | 22/8/19 | PPT, Black board marker |
| 23 | Views in SQL, Complex retrieval Queries using Group By | 19/8/19 | 23/8/19 | PPT, Black board marker |
| 24 | Recursive Queries, Nested Queries | 21/8/19 | 24/8/19 | PPT, Black board marker |
| 25 | Referential Integrity in SQL, ECA model (Triggers) in SQL | 22/8/19 | 26/8/19 | PPT, Black board marker |
| 26 | , ECA model (Triggers) in SQL | 23/8/19 | 28/8/19 | PPT, Black board marker |
| 27 | Database Programming with JDBC, | 26/8/19 | 29/8/19 | PPT, Black board marker |
| 28 | Security and Authorization in SQL | 28/8/19 | 30/8/19 | PPT, Black board marker |
| 29 | Functions and Procedures in SQL, | 29/8/19 | 9/9/19 | PPT, Black board marker |
| 30 | Cursors | 30/8/19 | 11/9/19 | PPT, Black board marker |
| 31 | Design guidelines for relational schema, | 9/9/19 | 13/9/19 | black board and chalk |
| 32 | Functional dependencies, Candidate Keys, Decomposition | 11/9/19 | 16/9/19 | black board and chalk |
| 33 | Definition of Normal Forms: 1NF, 2NF | 12/9/19 | 18/9/19 | black board and chalk |
| 34 | 3NF | 13/9/19 | 20/9/19 | black board and chalk |
| 35 | BCNF | 16/9/19 | 23/9/19 | black board and chalk |
| 36 | Converting Relational Schema to Higher Normal Forms | 18/9/19 | 26/9/19 | black board and chalk |
| 37 | Problems on Normalization | 19/9/19 | 30/9/19 | black board and chalk |
| 38 | Disk Management  Operations on Files, | 20/9/19 | 3/10/19 | PPT,Black board marker |
| 39 | Hashing Techniques | 23/9/19 | 4/10/19 | PPT,Black board marker |
| 40 | Types of Indexes: Single-Level Ordered Indexes; Multilevel indexes | 25/9/19 | 7/9/19 | PPT,Black board marker |
| 41 | Multilevel indexes | 26/9/19 | 9/9/19 | PPT,Black board marker |
| 42 | Overview of B-Trees and B+ Trees | 27/9/19 | 10/9/19 | PPT,Black board marker |
| 43 | Indexes on Multiple Keys | 30/9/19 | 11/9/19 | PPT,Black board marker |

**Lab Plan for SQL Lab**

**Lab Outcomes:**

LO1 -Construct problem definition statements for real life applications and implement a database for the same.

LO2- Design conceptual models of a database using ER modeling for real life applications and alsoconstruct queries in Relational Algebra.

LO3- Create and populate a RDBMS, using SQL.

LO4- Write queries in SQL to retrieve any type of information from a data base.

LO5- Analyze and apply concepts of normalization to design an optimal

database.Lab Plan: DBMS

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| --- | --- | --- | --- |
| Sr. No | Topic | Week No | Lab outcome |
| 1 | To Design EER Model for Project | Week1 | LO2 |
| 2 | To implement DDL Commands in Postgresql | Week2 | LO3 |
| 3 | To implement DML Commands in Postgresql | Week3 | LO4 |
| 4 | To implement Aggregate functions in Postgresql | Week 4 | LO4 |
| 5 | To implement Complex SQL Commands in Postgresql | Week5 | LO4 |
| 6 | To implement Constraints in Postgresql | Week6 | LO4 |
| 7 | To implement PL/SQL block in Postgresql | Week7 | LO4 |
| 8 | To implement Functions, triggers and Cursors in Postgresql | Week8 | LO4 |
| 9 | To implement JDBC Connectivity with Postgresql | Week9 | LO4 |
| 10 | To implement Views in Postgresql | Week10 | LO4 |
| 11 | Project |  | LO1,LO2,LO3,LO4 |

**Assignment Plan:**

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| --- | --- | --- | --- |
| **Assignment No** | **Date** | **Questions** | **CO/LO** |
| **1** | **16/8/2019** |  | **LO2,CO2,CO3** |
| **2** | **25/9/2019** |  | **CO5, LO5** |

**Assignment No 1 Questions**

**Q.1> Consider the following schema for institute library**

Student(rollno,name,branch)

Book( ISBN,title,author,publisher)

Issue(rollno,ISBN,date\_of\_issue)

Write SQL queries and equivalent Relational Algebra expression for the following statements. (CO2 ,CO4)

1. List roll numbers and names of all the students of the IT branch.
2. Find the name of students who have issued book published by ‘ABC’ publisher.
3. List the title of all books and their author issued by student ‘Alex’
4. List the title of all books issued on or before 1st Jan 2014

**Q.2> Consider the following schema for the Emp\_Dept database.**

Emp(eid,ename,salary,address,deptid)

Dept( deptid,dname,address)

Issue(rollno,ISBN,date\_of\_issue)

Write SQL queries and equivalent Relational Algebra expression for the following statements.

(CO2 ,CO4)

1. Find the names of employee whose address is ‘Bandra’.
2. Find the names of employee earning highest salary.
3. Find all employees working for ‘HR’ department.
4. Delete record of employee with min salary.
5. Display name of the department.

**Q.3> Consider the following schema for the Employee database.**

Emp(ename,street,city,date\_of\_join)

Works(ename,company\_name,salary)

company( company\_name,city)

manages(ename,manager\_name)

Write SQL queries and equivalent Relational Algebra expression for the following statements.

(CO2 ,CO4)

1. Change the city of employee ‘John’ to ‘mumbai’.
2. Find the names of employee in each city with date of join as 1st aug 2017.
3. List the names of compny starting with “A”.
4. Display ename, manager\_name ,city of those employees whose date of join is greater than ‘01-01-2014’

**[TEITC503.3]**

**Assignment No 2 Questions**

Q.1 ) Relation R(A,B,C,D) with following functional dependencies

FD={ A->B, B->C, C->D}

1. Find all candidate keys for relation R
2. Find the primary key

Q.2 ) Relation R(A,B,C,D,E) with following functional dependencies

FD={ A->B, BC->D,E->C,D->A}

1. Find all candidate keys for relation R
2. Find the primary key

Q.3 ) Relation R(P,Q,R,S,T,U) with following functional dependencies

FD={ P->Q, ST->PR, S->U}

1. Find the key for relation R
2. Decompose relation R upto BCNF

Q.4 ) Relation R(A,B,C,D,E,F,G,H,I,J) with following functional dependencies

FD={ AB->C, A->DE, B->F, F->GH, D->I J }

1. Find the key for relation R
2. Decompose relation R upto 3NF

Q.5 )

Property(Prop\_id,country\_name,lot#,Area,Price,Tax\_rate) with following functional dependencies

\*Prop\_id is the primary key

FD1= Prop\_id -> country\_name,lot#,Area,Price,Tax\_rate

FD2= country\_name,lot#->Area,Price,Tax\_rate, Prop\_id

FD3= country\_name->Tax\_rate

FD4= Area-> Price

Decompose Property relation upto BCNF

**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)