



MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

COURSE PLAN

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|---------------------------|---|--------------------------------------|---|---|---|
| Department | : | Computer Science and Engineering | | | |
| Course Name & code | : | Advanced Database Systems & CSE 5153 | | | |
| Semester & branch | : | I & MTech (CSE and CSIS) | | | |
| Name of the faculty | : | Vivekanand Bhat | | | |
| No of contact hours/week: | | L | T | P | C |
| | | 3 | 1 | 0 | 4 |

Course Outcomes (COs)

| <i>At the end of this course, the student should be able to:</i> | | No. of Contact Hours | Marks |
|--|---|----------------------------|-------|
| CO1: | Understand the concepts of Distributed Database Systems (DDBSs), its Design issues and View Management. | 10 | 21 |
| CO2: | Analyse the techniques in Distributed Query Processing and Optimization. | 8 | 18 |
| CO3: | Evaluate problems with Transactions Management and Concurrency Control in a Distributed system. | 8 | 18 |
| CO4: | Use the different protocols to handle Reliability and Replication in DDBSs. | 10 | 21 |
| CO5: | Evaluate and apply NoSQL Data Models for Data Intensive Applications. | 12 | 22 |
| Total | | 48 | 100 |

Assessment Plan

| Components | Assignments | Sessional Tests | End Semester/ Make-up Examination |
|-----------------------|---|---|---|
| Duration | 20 to 30 minutes | 60 minutes | 180 minutes |
| Weightage | 20 % (4 X 5 marks) | 30 % (2 X 15 Marks) | 50 % (1 X 50 Marks) |
| Typology of Questions | Understanding/ Comprehension; Application; Analysis; Synthesis; Evaluation | Knowledge/ Recall; Understanding/ Comprehension; Application | Understanding/ Comprehension; Application; Analysis; Synthesis; Evaluation |
| Pattern | Answer one randomly selected question from the problem sheet (Students can refer their class notes) | MCQ: 10 questions (0.5 marks) Short Answers: 5 questions (2 marks) | Answer all 5 full questions of 10 marks each. Each question may have 2 to 3 parts of 3/4/5/6/7 marks |
| Schedule | 4, 7, 10, and 13 th week of academic calendar | Calendared activity | Calendared activity |
| Topics Covered | Quiz 1 (L 1-8 & T _{y1-y2}) (CO1) | Test 1 (L 1-20 & T _{b1-b2}) (CO1-2) | Comprehensive examination covering full syllabus. Students are expected to answer all questions (CO1-5) |
| | Quiz 2 (L 9-16 & T _{y3-y4}) (CO1-2) | | |
| | Quiz 3 (L 18-26 & T _{y5-y6}) (CO3-4) | Test 2 (L 21-40 & T _{b3-b4}) (CO3-4) | |
| | Quiz 4 (L 27-35 & T _{y7-y8}) (CO4-5) | | |

Lesson Plan

| L. No. | Topics | Course Outcome Addressed |
|--------|---|--------------------------|
| L0 | Click or tap here to enter text. | CO1 |
| L1 | INTRODUCTION: Distributed Data Processing | CO1 |
| L2 | Promises of DDBSs, Complications Introduced by Distribution | CO1 |
| L3 | DDBS Design Issues, Distributed DDMS Architecture | CO1 |
| L4 | DISTRIBUTED DATABASE DESIGN: Top-Down Design Process | CO1 |
| L5 | Distributed Design Issues | CO1 |
| L6 | Fragmentation, Allocation | CO1 |
| L7 | Data Directory | CO1 |
| L8 | DATA ACCESS CONTROL: View Management | CO1 |
| L9 | Data Security | CO1 |
| L10 | Semantic Integrity Control | CO1 |

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| L11 | QUERY PROCESSING: | CO2 |
| L12 | Query Processing Problem, Objectives of Query Processing | CO2 |
| L13 | Complexity of Relational Algebra Operations | CO2 |
| L14 | Characterization of Query Processors | CO2 |
| L15 | Layers of Query Processing | CO2 |
| L16 | Query Decomposition | CO2 |
| L17 | Data Localization, Global Query Optimization | CO2 |
| L18 | Distributed Query Optimization | CO2 |
| L19 | TRANSACTION MANAGEMENT AND CONCURRENCY CONTROL: | CO3 |
| L20 | Properties of Transactions | CO3 |
| L21 | Types of Transactions | CO3 |
| L22 | Serializability Theory | CO3 |
| L23 | Locking-Based Concurrency Control Algorithm | CO3 |
| L24 | Timestamp-Based Concurrency Control Algorithm | CO3 |
| L25 | Dead lock Management | CO3 |
| L26 | “Relaxed” Concurrency Control | CO3 |
| L27 | DISTRIBUTED DATA RELIABILITY: | CO4 |
| L28 | Reliability Concepts | CO4 |
| L29 | Failures in Distributed DBMS | CO4 |
| L30 | Local Reliability Protocols | CO4 |
| L31 | Distributed Reliability Protocols | CO4 |
| L32 | DATA REPLICATION: Consistency of Replicated Databases | CO4 |
| L33 | Update Management Strategies | CO4 |
| L34 | Replication Protocols | CO4 |
| L35 | Group Communication, Replication and Failures | CO4 |
| L36 | Replication Mediator Service | CO4 |
| L37 | NOSQL DATA MODELS: | CO5 |
| L38 | Aggregate Data Models | CO5 |
| L39 | More details on Data Models | CO5 |

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| L40 | Distribution Models | CO5 |
| L41 | Distribution Models (Contd.) | CO5 |
| L42 | Consistency | CO5 |
| L43 | Version Stamps | CO5 |
| L44 | Map Reduce | CO5 |
| L45 | Schema Migration | CO5 |
| L46 | Polyglot Persistence | CO5 |
| L47 | Beyond NoSQL | CO5 |
| L48 | Choosing the database | CO5 |
| L/T | Click or tap here to enter text. | |
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References:

1. M. Tamer Ozsu, Patrick Valduriez, "Principles of Distributed Database Systems", (3e), Springer, 2011
2. Pramod J. Sadalage, Martin Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", (1e), Person Education, Inc., 2013.
3. Saeed K. Rahimi and Frank S, Haug, "Distributed Database Management Systems: A Practical Approach", (1e), John Wiley & Sons, 2010.
4. Martin Kleppmann, "Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems", (1e), O'Reilly Media, Inc., 2017.
5. Guy Harrison, "Next Generation Databases: NoSQL, NewSQL and BigData", (1e), Apress, 2015.
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Submitted by: VIVEKANAND BHAT

(Signature of the faculty)

Date: 22-07-2019

Approved by: DR. ASHALATHA NAYAK

(Signature of HOD)

Date: 22-07-2019

FACULTY MEMBERS TEACHING THE COURSE (IF MULTIPLE SECTIONS EXIST):

| FACULTY | SECTION | FACULTY | SECTION |
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