**COURSE PLAN**

|  |  |
| --- | --- |
| Target | 50% (marks) |
| Level-1 | 40% (population) |
| Level-2 | 50% (population) |
| Level-3 | 60% (population) |

1. **Method of Evaluation**

|  |  |
| --- | --- |
| **UG** | **PG** |
| Quizzes/Tests, Assignments (30%) | ~~Quizzes/Tests, Assignments, seminar (50%)~~ |
| Mid Examination (20%) | ~~End semester (50%)~~ |
| End examination (50%) |  |

1. **Passing Criteria**

|  |  |  |
| --- | --- | --- |
| **Scale** | **PG** | **UG** |
| **Out of 10 point scale** | ~~SGPA – “6.00” in each semester~~  ~~CGPA – “6.00”~~  ~~Min. Individual Course Grade  –  “C”~~  ~~Course Grade  Point –  “4.0”~~ | SGPA – “5.0” in each semester  CGPA – “5.0”  Min. Individual Course Grade  –  “C”  Course Grade  Point –  “4.0” |

\*for PG, passing marks are 40/100 in a paper

\*for UG, passing marks are 35/100 in a paper

1. **Pedagogy**
2. Presentation (Synchronous session-F2F)
3. Asynchronous session-Voice over PPT, Instructional video, Notes)
4. Flipped classroom session
5. Think-pair and share

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1. **References:**

|  |  |  |  |
| --- | --- | --- | --- |
| Text Books | Web resources | Journals | Reference books |
| 1.Fundamentals of Database Systems by Ramez Elmasri and Shamkant B. Navathe, Pearson India | <https://nptel.ac.in/courses/106/106/106106093/> | Database Management & Information Retrieval  (Springer) | 1. Database System Concepts by Abraham Silberschatz, Henry F. Korth and S. Sudarshan, McGraw-Hill  2. Database Systems-The Complete Book by Jeffrey D. Ullmam, Pearson India |

**GUIDELINES TO STUDY THE SUBJECT**

**Instructions to Students:**

1. Go through the 'Syllabus' in the LMS of the web-site (https://myupes.upes.ac.in/Login) in order to find out the Reading List.
2. Get your schedule and try to pace your studies as close to the timeline as possible.
3. Get your on-line lecture notes (Content, videos) at Lecture Notes section.  These are our lecture notes. Make sure you use them during this course.
4. Check your LMS regularly
5. Go through study material
6. Check mails and announcements on LMS and UPES student mail id
7. Keep updated with the posts, assignments and examinations which shall be conducted on the LMS
8. Be regular, so that you do not suffer in any way
9. C**ell Phones and other Electronic Communication Devices:** Cell phones and other electronic communication devices (such as Blackberries/Laptops) are not permitted in classes during Tests or the Mid/Final Examination. Such devices MUST be turned off in the class room.
10. **E-Mail and online learning tool:** Each student in the class should have an e-mail id and a pass word to access the LMS system regularly. Regularly, important information – Date of conducting class tests, guest lectures, via online learning tool. The best way to arrange meetings with us or ask specific questions is by email and prior appointment. All the assignments preferably should be uploaded on online learning tool. Various research papers/reference material will be mailed/uploaded on online learning platform time to time.
11. **Attendance:** Students are required to have minimum attendance of 75% in each subject. Students with less than said percentage shall NOT be allowed to appear in the end semester examination.

This much should be enough to get you organized and on your way to having a great semester! If you need us for anything, send your feedback through e-mail [to](mailto:abc@ddn.upes.ac.in) your concerned faculty. Please use an appropriate subject line to indicate your message details.

There will no doubt be many more activities in the coming weeks. So, to keep up to date with all the latest developments, please keep visiting this website regularly.

**RELATED OUTCOMES**

1. **The expected outcomes of the Program are:**

|  |  |
| --- | --- |
| PO1 | **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. |
| PO2 | **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. |
| PO3 | **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. |
| PO4 | **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. |
| PO5 | **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations. |
| PO6 | **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. |
| PO7 | **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. |
| PO8 | **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| PO9 | **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. |
| PO10 | **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. |
| PO11 | **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. |
| PO12 | **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. |

1. **The expected outcomes of the Specific Program are: (upto3)**

|  |  |
| --- | --- |
| PSO1 | Perform system and application programming using computer system concepts, concepts of Data Structures, algorithm development, problem solving and optimizing techniques. |
| PSO2 | Apply software development and project management methodologies using concepts of front-end and back-end development and emerging technologies and platforms. |
| PSO3 | Understand and apply Cloud Computing architecture for scalable, secure and dynamically provisioned business oriented environment with optimized performance tuning and data reliability. |

1. **The expected outcomes of the Course are: (minimum 3 and maximum 6)**

|  |  |
| --- | --- |
| CO 1 | Explain the terminologies, features and models of database systems. |
| CO 2 | Apply various disk storage, Indexing and hashing techniques for data storage. |
| CO 3 | Formulate SQL queries using relational algebra and relational calculus. |
| CO 4 | Apply normalization theory to database design. |
| CO 5 | Develop database application design and its implementation including integrity constraints, transaction management and concurrent control algorithms. |
| CO 6 | Discuss database models like Object Oriented Databases, Distributed Databases. |

1. **Co-Relationship Matrix**

Indicate the relationships by1- Slight (low) 2- Moderate (Medium) 3-Substantial (high)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Program**  **Outcomes**  **Course Outcomes** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** | **PSO3** |
| **CO 1** |  | 1 | 2 | 2 |  |  |  |  |  |  |  |  | 2 | 3 |  |
| **CO 2** |  | 3 | 2 | 2 |  |  |  |  |  |  |  |  | 2 | 3 |  |
| **CO 3** |  | 3 | 2 | 3 |  |  |  |  |  |  |  |  | 2 | 3 |  |
| **CO 4** |  | 3 | 2 | 3 |  |  |  |  |  |  |  |  | 2 | 3 |  |
| **CO 5** |  | 3 | 2 | 2 |  |  |  |  |  |  |  |  | 2 | 2 |  |
| **CO 6** |  | 2 | 1 | 1 |  |  |  |  |  |  |  |  | 2 | 1 |  |
| **Average** |  | 2.8 | 1.8 | 2.16 |  |  |  |  |  |  |  |  | 2 | 2.5 |  |

1-weak 2-moderate 3-strong

1. **Course outcomes assessment plan:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **components**  **Course Outcomes** | **Assignment** | **Test/Quiz** | **Mid Semester** | **End Semester** | **Any other** |
| **CO 1** |  | **√** | **√** | **√** |  |
| **CO 2** |  | **√** |  | **√** |  |
| **CO 3** |  | **√** | **√** | **√** |  |
| **CO 4** |  | **√** | **√** | **√** |  |
| **CO 5** |  | **√** |  | **√** |  |
| **CO 6** |  | **√** |  | **√** |  |

**BROAD PLAN OF COURSE COVERAGE**

**Course Activities:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S. No. | Description | Planned | | | Actual | | | Remarks |
| From | To | No. of Ses | From | TO | No. of Ses |
| 1. | Overview Of Databases and Data Modelling |  |  | 8 |  |  |  | CO1 |
| 2. | Relational Algebra and Normalization |  |  | 6 |  |  |  | CO3, CO4 |
| 3. | DBMS Architecture, Query Processing and Optimization |  |  | 8 |  |  |  | CO3 |
| 4. | Disk Storage, Basic File Structures, Hashing and Indexing |  |  | 7 |  |  |  | CO2 |
| 5. | Transaction Management, Concurrency Control and Recovery Techniques |  |  | 11 |  |  |  | CO5 |
| **6.** | OODB and Distributed Database |  |  | 5 |  |  |  | CO6 |

Sessions: Total No. of Instructional periods available for the course

**SESSION PLAN**

**UNIT-I**

|  |  |  |
| --- | --- | --- |
| **Lecture No.** | Topics to be Covered | CO Mapped |
| 1 | Database & Database users and basics of SQL, characteristics and advantages of the database,  Database systems, concepts and architecture | CO1 |
| 2 | Data models, schemas & instances, Codd’s Rule | CO1 |
| 3 | Three-Schema architecture & data independence | CO1 |
| 4 | Database languages & interfaces, Centralized and Client/Server Architecture of DBMS | CO1 |
| 5 | Classification of DBMS | CO1 |
| 6 | ER Diagrams | CO1 |
| 7 | EER Diagrams | CO1 |
| 8 | Mapping of ER and EER Model to Relations | CO1 |

**UNIT-II**

|  |  |  |
| --- | --- | --- |
| **Lecture No.** | **Topics to be Covered** | **CO Mapped** |
| 9 | Relational model Concepts, Relational model constraint & relational database schemas,  transactions, and dealing with constraint Violation, | CO3 |
| 10 | DBMS Keys | CO3 |
| 11 | Relational Algebra, Unary relational operation, Binary relational operations and,  relational algebra operations from set Theory | CO3 |
| 12 | Relational Calculus; and implementation in SQL | CO3 |
| 13 | Informal Design guideline for relational Schemas, Functional Dependencies,  Normal forms based on primary keys, (1NF, 2NF, 3NF & BCNF) | CO3, CO4 |
| 14 | lossless join and dependency preserving decomposition,  Multivalued dependencies (4NF, 5NF), domain key normal form | CO3, CO4 |

**UNIT-III**

|  |  |  |
| --- | --- | --- |
| **Lecture No.** | **Topics to be Covered** | **CO Mapped** |
| 15 | DBMS Instance, DBMS Internal Memory Structure, Background Processes,  Data Types, Roles & Privileges | CO3 |
| 16 | Introduction to Query Processing | CO3 |
| 17 | Translating SQL Queries into Relational Algebra | CO3 |
| 18 | Translating Relational Algebra into SQL Queries | CO3 |
| 19 | Algorithms for External Sorting | CO3 |
| 20 | Algorithms for SELECT and JOIN Operations | CO3 |
| 21 | Algorithms for PROJECT and SET Operations | CO3 |
| 22 | Implementing Aggregate Operations and Outer Joins | CO3 |

**UNIT-IV**

|  |  |  |
| --- | --- | --- |
| **Lecture No.** | **Topics to be Covered** | **CO Mapped** |
| 23 | Introduction, Secondary Storage Devices,  Buffering of Blocks and Placing File Records on Disk, Operations on Files | CO2 |
| 24 | Heap Files, Sorted Files | CO2 |
| 25 | Hashing Techniques | CO2 |
| 26 | Parallelizing Disk Access using RAID Technology | CO2 |
| 27 | Secondary Access Paths, Types of Single-Level Ordered Indexes | CO2 |
| 28 | Multilevel Indexes, Dynamic Multilevel Indexes Using B-Trees and B+ Trees | CO2 |
| 29 | Indexes on Multiple Keys | CO2 |

**UNIT-V**

|  |  |  |
| --- | --- | --- |
| **Lecture No.** | **Topics to be Covered** | **CO Mapped** |
| 30 | Introduction to Transaction Processing, Transaction and System Concepts | CO5 |
| 31 | Desirable Properties of Transactions | CO5 |
| 32 | Characterizing Schedules based on Recoverability | CO5 |
| 33 | Characterizing Schedules based on Serializability | CO5 |
| 34 | Introduction to Concurrency Control | CO5 |
| 35 | Two Phase Locking Techniques | CO5 |
| 36 | Concurrency Control on Timestamp Ordering | CO5 |
| 37 | Validation Concurrency Control Techniques | CO5 |
| 38 | Granularity of Data items | CO5 |
| 39 | Multiple Granularity Locking,  Recovery Concepts, Recovery Techniques Based on Deferred and Immediate Update | CO5 |
| 40 | Shadow Paging | CO5 |

**UNIT-VI**

|  |  |  |
| --- | --- | --- |
| **Lecture No.** | **Topics to be Covered** | **CO Mapped** |
| 41 | Overview of Object-Oriented Concepts, Object Model of ODMG,  Object Definition Language, Object Query Language | CO6 |
| 42 | Object Database Conceptual Design, Distributed Database Concepts | CO6 |
| 43 | Data Fragmentation, Replication and Allocation Techniques for Distributed Design | CO6 |
| 44 | Types of Distributed Database Systems | CO6 |
| 45 | Query Processing in Distributed Databases,  Overview of Concurrency Control and recovery techniques in Distributed Databases | CO6 |

\*Green highlighted lectures are in asynchronous mode.

**ASYNCHRONOUS SESSION PLAN**

|  |  |  |
| --- | --- | --- |
| Session Plan | | |
| Lect. | Topics to be Covered | CO-Mapped |
| 1 | Centralized and Client/Server Architecture of DBMS | CO1 |
| 2 | Classification of DBMS | CO1 |
| 3 | EER Diagrams | CO1 |
| 4 | Multivalued dependencies (4NF, 5NF), domain key normal form | CO3,CO4 |
| 5 | DBMS Instance, DBMS Internal Memory Structure, Background Processes,  Data Types, Roles & Privileges | CO3 |
| 6 | Algorithms for PROJECT and SET Operations | CO3 |
| 7 | Implementing Aggregate Operations and Outer Joins | CO3 |
| 8 | Hashing Techniques | CO2 |
| 9 | Parallelizing Disk Access using RAID Technology | CO2 |
| 10 | Indexes on Multiple Keys | CO2 |
| 11 | Multiple Granularity Locking,  Recovery Concepts, Recovery Techniques Based on Deferred and Immediate Update | CO5 |
| 12 | Shadow Paging | CO5 |
| 13 | Overview of Object-Oriented Concepts, Object Model of ODMG,  Object Definition Language, Object Query Language | CO6 |
| 14 | Types of Distributed Database Systems | CO6 |
| 15 | Query Processing in Distributed Databases,  Overview of Concurrency Control and recovery techniques in Distributed Databases | CO6 |

Signature of Faculty Date: