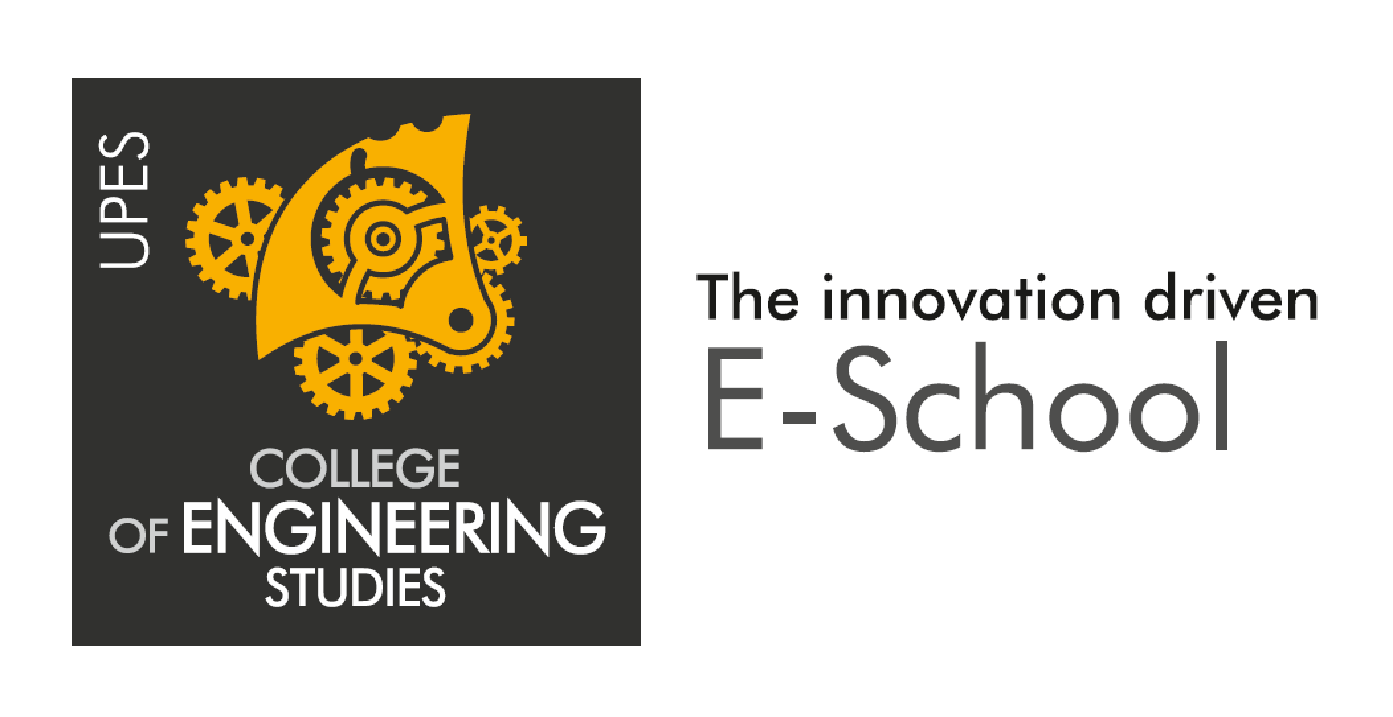
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**UNIVERSITY OF PETROLEUM & ENERGY STUDIES**

**School of Computer Science**

**Dehradun**

**COURSE PLAN**

Programme : B. Tech (CSE) - Dept. of IT Infrastructure

Course : Database Management Systems

Course Code : CSEG1005

No. of credits : 3 (2-Offline, 1-Online)

Semester : II

Session : 2017-18 (Jan-May-2018)

Batch : 2017-21

Prepared by : Prashant Rawat

Email : [prashant.rawat@ddn.upes.ac.in](mailto:prashant.rawat@ddn.upes.ac.in)

**Approved By**

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Faculty HOD

UPES Campus Tel: +91-135-2770137

“Energy Acres” Fax: +91 135- 27760904

P.O. Bidholi, Via Prem Nagar, Dehradun Website: [www.upes.ac.in](http://www.upes.ac.in)

**COURSE PLAN**

1. **PREREQUISITE:**
   1. Basic Knowledge Data Structure
   2. Basic Knowledge of File Processing System
2. **PROGRAM OUTCOMES (POs) and PROGRAM SPECIFIC OUTCOMES (PSOs):**

**B1. PROGRAM OUTCOMES (POs)**

**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.

**B2. Program Specific Outcomes (PSOs)**

**PSO13:** Perform system and application programming using computer system concepts, concepts of Data Structures, algorithm development, problem solving and optimizing techniques.

**PSO14:** Apply software development and project management methodologies using concepts of front-end and back-end development and emerging technologies and platforms.

**PSO15:** Ability to design, develop and manage scalable IT Infrastructure.

**B3. OBJECTIVES OF COURSE:-**

The objectives of this course are to:

1. Gain a good understanding of the architecture and functioning of database management systems as well as associated tools and techniques, principles of data modeling using entity relationship and develop a good database design and normalization techniques to normalize a database.
2. Understand the use of structured query language and its syntax, transactions, database recovery and techniques for query optimization.
3. Acquire a good understanding of database systems concepts and to be in a position to use and design databases for different applications.
4. **Course Outcomes for Database Management Systems**

CO 1. Define the terminology, features, classifications, and characteristics of database systems.

CO 2. Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram.

CO 3. Demonstrate relational data model, transform an information model into a relational database schema and to use a data definition language or utilities to implement the schema using a DBMS.

CO 4. Formulate using relational algebra, relational calculus and SQL solutions to a broad range of query problems.

CO 5. Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.

CO 06. Analyzing the process of query optimization with various algorithms.

**Table: Mapping of POs and PSOs v/s COs**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO 12 | PSO 13 | PSO 14 | PSO  15 |
| CO1 | - | - | 1 | - | 1 | 3 | - | - | - | - | - | - | - | 1 | - |
| CO2 | - | 1 | 1 | - | 1 | - | - | - | - | - | - | - | - | 1 | - |
| CO3 | - | 2 | 3 | - | 2 | 1 | - | - | - | - | 1 | - | - | 3 | - |
| CO4 | - | 3 | 1 | - | 2 | 1 | - | - | - | - | 2 | - | - | 3 | - |
| CO5 | - | - | 2 | - | 2 | - | - | - | - | - | - | - | 1 | 3 | - |
| CO6 | - | - | 1 | - | 1 | - | - | - | - | - | - | - | 1 | 1 | - |

**Table: Correlation of POs and PSOs v/s COs**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Engineering Knowledge | Problem analysis | Design/development of solutions | Conduct investigations of complex problems | Modern tool usage | The engineer and society | Environment and sustainability | Ethics | Individual or team work | Communication | Project management and finance | Life-long Learning | System and application programming | Software development and project management methodologies | Ability to design, develop and manage scalable IT Infrastructure. |
| Course Code | Course Title | PO1 | PO2 | PO3 | PO 4 | PO 5 | PO6 | PO 7 | PO8 | PO9 | PO 10 | PO 11 | PO12 | PSO13 | PSO14 | PSO15 |
| CSEG1005 | Database Management Systems | - | 1 | 2 | - | 2 | 1 | - | - | - | - | 1 | - | 1 | 2 | - |

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

1. **COURSE OUTLINE**

|  |  |  |
| --- | --- | --- |
| **S. No** | **Unit** | **Contents** |
| 1. | Unit I | OVERVIEW OF DATABASES |
| 2. | Unit II | DATA MODELLING USING THE ENTITY-RELATIONSHIP APPROACH |
| 3. | Unit III | RELATIONAL MODEL |
| 4. | Unit IV | RELATIONAL DATA BASE DESIGN |
| 5. | Unit V | ORACLE & DB2 ARCHITECTURE |
| 6. | Unit VI | QUERY PROCESSING AND OPTIMIZATION |

1. **PEDAGOGY**
2. Class Test
3. Assignment
4. Quiz
5. Digital and analog Presentations
6. **COURSE COMPLETION PLAN**

|  |  |
| --- | --- |
| Total Class room sessions | 36 |
| Total Quizzes | 02 |
| Total Test | 02 |
| Total Assignment | 02 |

One Session =60 minutes

1. **EVALUATION & GRADING**

Students will be evaluated based on the following 3 stages.

Internal Assessment - 30%

Mid-term Examination - 20%

End term Examination - 50%

**G1. INTERNAL ASSESSMENT: WEIGHTAGE – 30%**

Internal Assessment shall be done based on the following:

|  |  |  |
| --- | --- | --- |
| Sr. No. | Description | % of Weightage out of 30% |
| 1 | Class Tests and Quizzes | 50% |
| 2 | Assignments (Problems/Presentations) | 20% |
| 3 | Attendance and performance in the class and presentation | 30% |

**G2*. Internal Assessment Record Sheet (including Mid Term Examination marks)***

Sheet will be displayed online at the end of semester i.e. last week of regular classroom teaching.

**G3. CLASS TESTS/QUIZZES:**

Two Class Tests based on descriptive type theoretical & numerical questions and Two Quizzes based on objective type questions will be held; one class test and one quiz at least ten days before the Mid Term Examination and second class test and second quiz at least ten days before the End Term Examination. Those who do not appear in Viva-Voce and quiz examinations shall lose their marks.

*The marks obtained by the students will be displayed on LMS a week before the start of Mid Term and End Term Examinations respectively.*

**G4. ASSIGNMENTS:**

After completion of each unit or in the mid of the unit, there will be home assignments based on theory and numerical problems. Those who fail to submit the assignments by the due date shall lose their marks.

**G5. GENERAL DISCIPLINE:**

Based on student’s regularity, punctuality, sincerity and participation in the interactions.

*The marks obtained by the students will be displayed on LMS at the end of semester.*

**G6. MID TERM EXAMINATION: WEIGHTAGE – 20%**

Mid Term examination shall be Two Hours duration and shall be a combination ofShort and Long theory Questions.

***Date of showing Mid Term Examination Answer Sheets: Within a week after completion of mid semester examination.***

**G7. END TERM EXAMINATION: WEIGHTAGE – 50%**

End Term Examination shall be Three Hours duration and shall be a combination of Short and Long theory/numerical Questions.

**G8. GRADING:**

The overall marks obtained at the end of the semester comprising all the above three mentioned shall be converted to a grade.

1. **COURSE DELIVERY PLAN**

Shaded Content is online component.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| SESSION | TOPIC | Course Outcomes Addressed | Required Learning Resources  (including media) | Discussion(s) and  Postings on Frontier | Assignment(s)/Quizzes/ Tests |
| Unit I | | OVERVIEW OF DATABASES | | | |
| L1 | Database systems, concepts, characteristics and advantages of the database | 2 | T1 &R1 https://www.youtube.com/watch?v=1057YmExS-I | Lecture |  |
| L2 | Data models, schemas & instances, | 2 | Faculty Uploaded PPTs | Readings/ brief video/ presentations |  |
| L3 | Three-Schema architecture & data independence, | 2 | T1 &R1 https://www.youtube.com/watch?v=3ddQ12SJ5LE | Lecture |  |
| L4 | database languages & interfaces | 2 | Faculty Uploaded PPTs | Readings/ brief video/ presentations | Reflection-1 |
| L5 | Classification of DBMS.  Database users | 1 | T1 &R1 https://www.youtube.com/watch?v=Kq0oinCHK84 | Lecture |  |
| L6 | Database & database users and basics of SQL | 1 | T1 &R1 https://www.youtube.com/watch?v=Kq0oinCHK84 | Lecture |  |
| Unit II | | Data modeling using the entity-relationship approach | | | |
| L7 | Introduction to ERD | 3 | T1&R1 https://www.youtube.com/watch?v=Wv1c9K4788A | Lecture |  |
| L8 | Concept of Data Association,  entities, attributes | 3 | T1 https://www.youtube.com/watch?v=Wv1c9K4788A | Lecture |  |
| L9 | Relationship Types,  relationship sets , | 3 | Faculty Uploaded PPTs | Readings/ brief video/ presentations | Reflection-2 |
| L10 | Roles and Structural  constraint , and  working with SQL. | 3 | T1 https://www.youtube.com/watch?v=dwSqHhMl32Y | Lecture |  |
| L11 | Designing ER Dig, naming convention and Design issue | 3 | Faculty Uploaded PPTs | Readings/ brief video/ presentations | Assignment 1 |
| Unit III | | Relational model | | | |
| L12 | Relational model Concepts | 4 | T1 https://www.youtube.com/watch?v=NvrpuBAMddw | Lecture |  |
| L13 | Update operations and dealing with constraint Violation | 4 | T1 https://www.youtube.com/watch?v=CsGalH0QKbs | Lecture | Quiz 1 |
| L14 | Relational model constraint & relational database schemas | 4 | Faculty Uploaded PPTs | Readings/ brief video/ presentations | Test 1 |
| L15 | Relational algebra  operations | 5 | Faculty Uploaded PPTs | Readings/ brief video/ presentations | Reflection-3 |
| L16 | Relational Calculus; | 6 | T1 <https://www.youtube.com/watch?v=LL_eHNQA6wk>  https://www.youtube.com/watch?v=X5JLqdiHWcw | Lecture |  |
| L17 | Implementation in SQL  Codd’s Rule | 7 | T1 | Lecture | Mid term |
| Unit IV | | Relational data base design | | | |
| L18 | Informal Design guideline for relational Schemas | 8 | T1 https://www.youtube.com/watch?v=FVEPeCIVBtU | Lecture |  |
| L19 | Functional Dependencies | 8 | T1 https://www.youtube.com/watch?v=ddOP5D4fagg | Lecture |  |
| L20 | Inference rules of functional dependencies | 8 | T1 https://www.youtube.com/watch?v=YD8dhOmuVnY | Lecture |  |
| L21 | Normal forms based on primary keys and 1NF, | 8 | Faculty Uploaded PPTs | Readings/ brief video/ presentations | Reflection-4 |
| L22 | 2Normal form and 3 Normal form | 8 | T1 https://www.youtube.com/watch?v=YD8dhOmuVnY | Lecture |  |
| L23 | BCNF | 8 | Faculty Uploaded PPTs | Readings/ brief video/ presentations |  |
| L24 | Lossless join decomposition | 8 | T1 https://www.youtube.com/watch?v=TykMe1A2u6U | Lecture |  |
| L25 | dependency preservation  Multivalued dependencies | 8 | T1 https://www.youtube.com/watch?v=VOknBEe1YLo | Lecture |  |
| L26 | (4NF, 5NF) | 8 | Faculty Uploaded PPTs | Readings/ brief video/ presentations | Quiz 2 |
| Unit V | | ORACLE & DB2 ARCHITECTURE | | | |
| L27 | An Oracle *Database*  An Oracle *Instance*  Data processing | 9 | Faculty Uploaded PPTs | Readings/ brief video/ presentations |  |
| L28 | SQL processing and client interfaces | 9 | T1 & Faculty Notes |  |  |
| L29 | DB2-Logical Data Structures Physical Data Structure, | 9 | Faculty Uploaded PPTs | Readings/ brief video/ presentations | Discussion-2 |
| L30 | DB2-Instances, Table Spaces, Types of Table spaces, Object Model of ODMG | 9 | T1 & Faculty Notes | Lecture | Assignment 2 |
|  | Unit VI | Query Processing and optimization | | | |
| L31 | Introduction to Query Processing | 10 | T1 <https://www.youtube.com/watch?v=xCRGMwIlmtY>  https://www.youtube.com/watch?v=GYQZpYEaNvk | Lecture |  |
| L32 | Translating SQL Queries into Relational Algebra | 10 | Faculty Uploaded PPTs | Readings/ brief video/ presentations | Reflection-6 |
| L33 | Algorithms for External Sorting | 10 | T1 https://www.youtube.com/watch?v=GYQZpYEaNvk | Lecture | Test 2 |
| L34 | Algorithms for SELECT and JOIN Operations | 10 | T1 https://www.youtube.com/watch?v=GYQZpYEaNvk | Lecture |  |
| L35 | Algorithms for PROJECT and SET Operations. | 10 | T1 https://www.youtube.com/watch?v=GYQZpYEaNvk | Lecture |  |

1. **SUGGESTED READINGS:**

**I1. TEXT BOOK:**

1. Fundamentals of database systems, 6th edition, by Remez Elmasri and Shamkant b. Navathe, Pearson education
2. Sql, Pl/Sql the programming language of Oracle, iii- edition, Ivan Bayross

**I2. REFERRENCE BOOKS:**

1. Database System Concepts by Avi Silberschatz,Henry F. Korth,S. Sudarshan
2. Introduction to Database systems by Bipin Desai
3. Database Management Systems by C.J Date
4. Database Management System by Ramakrishnan
5. **GUIDELINES**

***Cell 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.

***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.

***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.

***Passing criterion:*** Student has to secure minimum 30%/40% marks of the “highest marks in the class scored by a student in that subject (in that class/group class)” individually in both the ‘End-Semester examination’ and ‘Total Marks’ in order to pass in that paper.

* Passing Criterion for B. Tech: Minimum 30% and 40% of the highest marks in the class applicable to the students admitted before July 2015 and onwards July 2015 respectively.
* Passing Criterion for M. Tech: minimum 40% of the highest marks in the class

1. **COURSE OUTCOME ASSESSMENT**

To assess the fulfilment of course outcomes two different approaches have been decided. Degree of fulfillment of course outcomes will be assessed in different ways through direct assessment and indirect assessment. In Direct Assessment, it is measured through quizzes, tests, assignment, Mid-term and/or End-term examinations. It is suggested that each examination is designed in such a way that it can address one or two outcomes (depending upon the course completion). Indirect assessment is done through the student survey which needs to be designed by the faculty (sample format is given below) and it shall be conducted towards the end of course completion. The evaluation of the achievement of the Course Outcomes shall be done by analyzing the inputs received through Direct and Indirect Assessments and then corrective actions suggested for further improvement.

**Sample format for Indirect Assessment of Course outcomes**

|  |
| --- |
| NAME: |
| *ENROLLMENT NO*: |
| SAP ID: |
| COURSE: B. Tech. 2nd Semester |
| PROGRAM: CSE (IFM) |

Please rate the following aspects of course outcomes of Database Management Systems

Use the scale 1-4\*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Sr. No.** | **Course Outcome** | **1** | **2** | **3** | **4** |
| 1 | CO 1. Define the terminology, features, classifications, and characteristics of database systems. |  |  |  |  |
| 2 | CO 2. Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram. |  |  |  |  |
| 3 | CO 3. Demonstrate relational data model, transform an information model into a relational database schema and to use a data definition language or utilities to implement the schema using a DBMS. |  |  |  |  |
| 4 | CO 4. Formulate using relational algebra, relational calculus and SQL solutions to a broad range of query problems. |  |  |  |  |
| 5 | CO 5. Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database. |  |  |  |  |
| 6 | CO 06. Analyzing the process of query optimization with various algorithms. |  |  |  |  |



