



BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
AUGS/ AGSR Division

SECOND SEMESTER, 2022-2023
Course Handout

13/01/2023

In addition to part I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course Number : CS F212

Course Title : Database Systems

Instructor-in-charge : Dr. Amit Dua (amit.dua@pilani.bits-pilani.ac.in)

Instructors:

Jaya Pathak (p20200412@pilani.bits-pilani.ac.in)
Ramakant Upadhyay (p20220021@pilani.bits-pilani.ac.in)

1. Scope and Objective of the course

The scope of the course is the basic concepts and implementation issues of a Database System. This course is intended to give students a solid background in databases, with a focus on relational database management systems. Topics include data modelling, database design theory, data definition and manipulation languages, storage and indexing techniques, query processing and optimisation, concurrency control and crash recovery. The emphasis is on learning the concepts through rigorous mathematical foundations and implementation details. The course also introduces the challenges posed by Big Data on database technology and the recent emergence of Non-relational databases.

2. Text Book

Silberschatz A, Korth H F, & Sudarshan S, *Database System Concepts*, 7e, TMH, 2019.

3. Reference Books

R1. Elmasri R, & Navathe S B, *Fundamental of Database System*, 7e, Pearson Education, 2016. R2. Ramakrishna R. & Gehrke J, *Database Management Systems*, 3e, Mc-Graw Hill, 2014.

4. Lecture Plan

Week	Lec No.	Learning Outcome	Topics	Reference
Week 1				

1	1-3	Introduction to Database Systems and Data Modeling	<ul style="list-style-type: none"> ▪ Objectives/Motivation ▪ Evolution of Database Systems ▪ Overview of a DBMS ▪ Advantages of a DBMS ▪ Recent Advances in Database Technology ▪ Database System Architecture ▪ Overview of Data Modeling 	TB: Ch. 1, 2 R1:Ch. 1, 2
Week 2				



BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
AUGS/ AGSR Division

2	4-6	Understanding Relational Model	<ul style="list-style-type: none"> ▪ Relational Model Concepts ▪ Entity-Relationship (ER) Modeling ▪ Enhanced ER (EER) Modeling ▪ ER, EER to Relational model 	TB: Ch. 2, 6 R1: Ch. 3, 4, 9
Week 3 and 4				
3 and 4	7-12	Database Design through Functional Dependencies & Normalization	<ul style="list-style-type: none"> ▪ Functional Dependencies ▪ Normal Forms: 1NF,2NF,3NF, BCNF ▪ Criterion for Good Database Design ▪ Multi-valued dependencies: 4NF ▪ Join Dependencies-5NF, PJNF 	TB: Ch. 7 R1:Ch.14, 15
Week 5				
5	13-16	Query Languages	<ul style="list-style-type: none"> ▪ Relational Algebra ▪ Relational Calculus <ul style="list-style-type: none"> ▪ Tuple Relational Calculus ▪ Domain Relational Calculus ▪ SQL (to be covered in Lab. Sessions) 	TB: Ch. 2, 3,4,5 R1:Ch. 6, 7, 8 + Class Notes
Mid Semester Examination				
Post Mid Semester Examination Week 1 and 2				
6,7	17-22	Data Storage & Indexing	<ul style="list-style-type: none"> ▪ File Organizations ▪ Organization of Records in Files ▪ RAID ▪ Indexing Structures <ul style="list-style-type: none"> ▪ Primary & Secondary Indexes ▪ Tree-structured Indexes ▪ Hash-based Indexes ▪ Multidimensional Indexes ▪ Bitmap Indexes 	TB: Chs. 12-14 R1:Chs. 16, 17

Week 3 and 4				
8,9	23-28	Query Processing & Optimization	<ul style="list-style-type: none"> ▪ Introduction to Operator Evaluation ▪ Algorithms for Relational Operators ▪ Sorting ▪ Cost-based Optimization ▪ Heuristic-based Optimization ▪ View Materialization 	TB: Chs. 15,16 R1: Chs. 18,19
Week 5				
10	29-31	Transaction management:	<ul style="list-style-type: none"> ▪ Transaction Management Overview <ul style="list-style-type: none"> ▪ Serial Schedule & Serializability <ul style="list-style-type: none"> ○ Conflict Serializability ○ View Serializability ○ Testing for Serializability ▪ Recoverability & Cascadeless Schedules 	TB: Chs. 17 R1: Chs. 20, 21
Week 6				
11	32-38	Concurrency Control & Crash Recovery	<ul style="list-style-type: none"> ▪ Concurrency Control <ul style="list-style-type: none"> ▪ Locking ▪ Time-stamping ▪ Crash Recovery <ul style="list-style-type: none"> ▪ Log-Based ▪ Shadow Paging 	TB: Chs. 18, 19 R1: Chs. 17, 18



BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
AUGS/ AGSR Division

Week 7 and 8				
12,13	39-40	Advanced Topics study	Overview of Big Data, Specialty databases & NoSQL Databases	TB: Chs. 20- 23 R1: 23-25 + Class Notes

5. Evaluation components

Component	Duration	Weightage(%)	Date & Time	Mode
Midsem	90 Mins.	30 %	< Mid-Sem>	Closed Book
Lab Test	15 minutes	5%	Lab hours	Open book
Lab Comprehensive	30 minutes	10 %	13 st April (Th)	OB
Project		20%	10 th April	OB

Comprehensive Exam	3 Hrs.	35 %	<Compre>	Partly Open
--------------------	--------	------	----------	-------------

6. Labs

A 2-hour, supervised lab will be organised every week. The labs will focus on learning SQL and a suitable host language. There will be a quiz with questions based on the topics/concepts covered in the labs.

7. Make-up Policy

Make-up will be granted strictly on extreme medical circumstances or hospitalisation only.

8. Chamber Consultation Hours:

Amit Dua: Monday 5-6 PM

9. **Notice:** All the notices will be on NALANDA/Canvas only.

Instructor in Charge
CS F212