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

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)**
Instructor(s)	**: Prof. Mukesh Kumar Rohil (rohil@pilani.bits-pilani.ac.in)**

Practical Instructors :

Prof. Mukesh Kumar Rohil (rohil@pilani.bits-pilani.ac.in)
Dr. Amit Dua (amit.dua@pilani.bits-pilani.ac.in)
Upendra Singh (p20170428@pilani.bits-pilani.ac.in)
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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 modeling, database design theory, data definition and manipulation languages, storage and indexing techniques, query processing and optimization, 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. Elmarsi 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	Lecture session	Learning Outcome	Topics	Reference
Week 1				
1	1-3	Introduction to Database Systems and Data Modeling	▪ 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				

2	4-6	Understanding Relational Model	▪ 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	▪ 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	▪ Relational Algebra
			▪ Relational Calculus
			  ▪ 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	▪ File Organizations
			▪ Organization of Records in Files
			▪ RAID
			▪ Indexing Structures
			  ▪ 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	▪ 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:	▪ Transaction Management Overview
			  ▪ Serial Schedule &Serializability
			    o Conflict Serializability
			    o View Serializability
			    o Testing for Serializability
			  ▪ Recoverability &Cascadeless Schedules
				TB: Chs. 17
				R1: Chs. 20, 21

Week 6				

11	32-34	Concurrency Control &Crash Recovery	▪ Concurrency Control
			  ▪ Locking
			  ▪ Time-stamping
			▪ Crash Recovery
			  ▪ Log-Based
			  ▪ Shadow Paging
				TB: Chs. 18, 19
				R1: Chs. 17, 18

Week 7 and 8				
12,13	35-40	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
Quiz 1	20 minutes	10 (30 marks)	18th Feb (Th)	OB
Midsem	90 Mins.	30 (90 marks)	\<TEST_1\>	Open Book
Lab Quiz	30 minutes	10 (30 marks)	1st April (Th)	OB
Quiz 2	20 minutes	10 (30 marks)	15th April (Th)	OB
Comprehensive Exam	3 Hrs.	40 (80 marks)	\<TEST_C\>	Partly Open

6. Labs

A 2-hour, supervised lab, will be organized every week. The labs will focus on learning SQL and a suitable host language. No marks for attendance. There will be a quiz which will have questions based on the topics/concepts covered in labs.

7. Make-up Policy

Make-up will be granted strictly on **prior permission** and for genuine reasons only.

8. Chamber Consultation Hours:

Amit Dua:	Monday 5-6 PM
Prof. Mukesh Kumar Rohil	Tuesday 4-5 PM
Upendra Singh	Saturday 4-5 PM
Abhishek Vyas	Monday 3-4 PM

9. Notice: All the notices will be put up on NALANDA only.

Instructor in Charge
CS F212