Department of Computer Science & Engineering
National Institute of Technology, Jamshedpur
(An Institution of national importance under MHRD, Govt. of India)

SPRING SEMESTER (B.Tech 4nd Sem.) 2019 - 2020

Course Handout

Course No. : **CS1401**

Course Title : **DBMS (4-0-2)**

Instructor-In-Charge : **Dr. Koushlendra Kumar Singh**

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 databases and the recent emergence of Non-relational databases.

2. Text Book:

Hector G Molina, Jeffrey D.Ullman and Jennifer Widom, Database Systems – The Complete Book, Pearson Education, 2002.

3. Reference Books:

R1. Ramakrishna R. & Gehrke J, Database Management Systems, 3e, Mc-Graw Hill, 2003.

R2. Silberschatz A, Korth H F, & Sudarshan S, Database System Concepts, 5e, TMH, 2005.

R3. Elmarsi R, & Navathe S B, Fundamental of Database System, 5e, Pearson Education, 2008.

R4. Robinson, I, Webber, J, & Eifrem E, Graph Databases, 2e, O'Reilly, 2015.

4. Lecture Plan:

Lecture No.	***Learning Objective***	***Topics***	***Chapter Reference***
1-2	Introduction to Database Systems	▪ Objectives/Motivation Evolution of Database Systems ▪ Overview of a DBMS ▪ Advantages of a DBMS Recent Advances in Database Technology	Ch. 1 R1:Ch.1 R2:Ch.1 R3:Chs. 1-2

		▪ Database System Architecture	
3-4	Data Modeling	Overview of Data Modeling Self Study ▪ Entity-Relationship (ER) Modeling ▪ Enhanced ER (EER) Modeling ▪ Network Data Model ▪ Hierarchical Data Model Case Study	Ch. 2 R1:Ch. 2 R2:Ch. 6, App.A,B R3:Chs.3-4, App. E, F
5-7	Understanding Relational Model	▪ Relational Model Concepts ▪ Relation as a Mathematical Model ▪ ER, EER to Relational model	Ch. 3 R1:Ch.3 R2:Chs.2,6 R3:Ch. 7
8-12	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 (self study)	Ch. 3 R1:Ch. 19 R2:Ch. 7, App. C R3:Chs. 10-11
13-16	Query Languages	▪ Relational Algebra ▪ Relational Calculus ✓ Tuple Relational Calculus ✓ Domain Relational Calculus ▪ SQL(to be covered in Lab. Sessions)	Ch. 5 R1:Ch. 4 R2:Chs.2,5 R3:Ch. 6 + Class Notes
17-23	Data Storage & Indexing	▪ File Organizations ▪ Organization of Records in Files ▪ Indexing Structures ✓ Primary & Secondary Indexes ✓ Tree-structured Indexes ✓ Hash-based Indexes ✓ Multidimensional Indexes ✓ Bitmap Indexes	Chs. 11-14 R1:Chs.8-11 R2:Chs.11-12 R3:Chs. 13-14
24-30	Query Processing & Optimization	▪ Introduction to Operator Evaluation ▪ Algorithms for Relational Operators ▪ Sorting ▪ Cost-based Optimization ▪ Heuristic-based Optimization ▪ System-R approach to Optimization ▪ View Materialization	Chs. 15-16 R1:Chs.12-15 R2:Chs.13-14 R3:Ch. 15

31-36	Transaction management: Concurrency Control & Crash Recovery	▪ Transaction Management Overview ✓ Serial Schedule & Serializability o Conflict Serializability o View Serializability o Testing for Serializability ▪ Recoverability & Cascadeless Schedules ▪ Concurrency Control ✓ Locking ✓ Time-stamping ▪ Crash Recovery ✓ Log-Based ✓ Shadow Paging	Chs. 17-19 R1:Chs.16-18 R2:Chs.15-17 R3:Chs. 17-19
37-40	Advanced Topics	▪ Big Data Management & NoSQL Databases o Column-oriented Databases o Graph Databases o Key-value pair Databases o o Document Databases	

5. Evaluation components

EC No.	Evaluation Component	Duration	Weightage	Date & Time	Nature of Component
1.	Mid Term	2hr	30%	Will decided by Examination Section	Closed Book
3	End Sem Exam	3 Hrs	50%		Closed Book
4.	TA		20%		

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.

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

Instructor In-Charge