**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI (RAJASTHAN)**
**Second Semester, 2015-2016**
**Course Handout (Part-II)**

10/01/2016

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. LAVIKA GOEL (lavika.goel@pilani.bits-pilani.ac.in)**
**Lab Instructors** : **Neetika Gupta (neetika.gupta@pilani.bits-pilani.ac.in)**
**Rupal Bhargava (rupal.bhargava@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 modeling, database design theory, data definition and manipulation languages, storage and indexing techniques, query processing and optimization, concurrency control and crash recovery. In addition to these traditional topics, this course covers a sample of advanced database topics such as distributed databases and spatio-temporal databases. The emphasis is on learning the concepts through rigorous mathematical foundations and implementation details.

## 2. Text Book

Silberschatz A, Korth H F, & Sudarshan S, ***Database System Concepts***, 6e, TMH, 2011.

## 3. Reference Books

R1. Ramakrishna R. & Gehrke J, ***Database Management Systems***, 3e, Mc-Graw Hill, 2003.
R2. Hector G Molina, Jeffrey D.Ullman and Jennifer Widom, ***Database Systems – The Complete Book***, Pearson Education, 2002.
R3. Elmarsi R, & Navathe S B, ***Fundamental of Database System*****,** 5e, Pearson Education**,** 2008.

## 4. Lecture Plan

| Lecture # | Learning Objective | Topics | Chapter Reference |
|---|---|---|---|
| 1-2 | Introduction to Database Systems | ▪ Objectives/Motivation<br>▪ Evolution of Database Systems<br>▪ Overview of a DBMS<br>▪ Advantages of a DBMS<br>▪ Recent Advances in Database Technology<br>▪ Database System Architecture | Ch. 1<br>R1:Ch. 1<br>R2:Ch. 1<br>R3:Chs. 1-2 |
| 3-4 | Data Modeling | Overview of Data Modeling<br>Self Study<br>▪ Entity-Relationship (ER) Modeling<br>▪ Enhanced ER (EER) Modeling<br>▪ Network Data Model<br>▪ Hierarchical Data Model<br>Case Study | Ch. 6, App. A, B<br>R1:Ch. 2<br>R2:Ch 2<br>R3:Chs. 3-4, App. D, E |
| 5-7 | Understanding Relational Model | ▪ Relational Model Concepts<br>▪ Relation as a Mathematical Model<br>▪ ER, EER to Relational model | Chs. 2, 6<br>R1:Ch. 3<br>R2: Ch. 3<br>R3:Ch. 7 |
| 8-12 | Database Design through Functional Dependencies & Normalization | ▪ Functional Dependencies<br>▪ Normal Forms: 1NF,2NF,3NF, BCNF<br>▪ Criterion for Good Database Design<br>▪ Multi-valued dependencies: 4NF<br>▪ Join Dependencies-5NF, PJNF (self study) | Ch. 7, App. C<br>R1:Ch. 19<br>R2: Ch. 3<br>R3:Chs. 10-11 |

| | | | |
|---|---|---|---|
| 13-16 | Query Languages | ▪ Relational Algebra<br>▪ Relational Calculus<br>  ▪ Tuple Relational Calculus<br>  ▪ Domain Relational Calculus<br>▪ SQL (to be covered in Lab. Sessions) | Chs. 2, 5<br>R1:Ch. 4<br>R2: Ch. 5<br>R3:Ch. 6<br>+ Class Notes |
| 17-23 | Data Storage & Indexing | ▪ File Organizations<br>▪ Organization of Records in Files<br>▪ RAID<br>▪ Indexing Structures<br>  ▪ Primary & Secondary Indexes<br>  ▪ Tree-structured Indexes<br>  ▪ Hash-based Indexes<br>  ▪ Multidimensional Indexes<br>  ▪ Bitmap Indexes | Chs. 11-12<br>R1:Chs. 8-11<br>R2: Chs. 11-14<br>R3:Chs. 13-14 |
| 24-30 | Query Processing & Optimization | ▪ Introduction to Operator Evaluation<br>▪ Algorithms for Relational Operators<br>▪ Sorting<br>▪ Cost-based Optimization<br>▪ Heuristic-based Optimization<br>▪ View Materialization | Chs. 13-14<br>R1:Chs. 12-15<br>R2: Chs. 15-16<br>R3:Ch. 15 |
| 31-33 | Transaction management: | ▪ Transaction Management Overview<br>  ▪ Serial Schedule & Serializability<br>  ○ Conflict Serializability<br>  ○ View Serializability<br>  ○ Testing for Serializability<br>  ▪ Recoverability & Cascadeless Schedules | Chs. 15<br>R1:Chs. 16<br>R2: Chs. 19<br>R3:Chs. 17 |
| 34-40 | Concurrency Control & Crash Recovery | ▪ Concurrency Control<br>  ▪ Locking<br>  ▪ Time-stamping<br>▪ Crash Recovery<br>  ▪ Log-Based<br>  ▪ Shadow Paging | Chs. 16-17<br>R1: Chs. 17-18<br>R2: Chs. 17-18<br>R3: Chs. 18-19 |

5. **Evaluation components**

| Component | Duration | Weightage(%) | Date & Time | Mode |
|---|---|---|---|---|
| Midsem | 90 Mins. | 25 | 16/3 9:00 - 10:30 AM | Closed Book |
| Online Lab. Test | 90 Mins. | 20 | TBA | Open Book |
| Quiz | | 15 | TBA | Closed Book |
| Comprehensive Exam | 3 Hrs. | 40 | 7/5 FN | 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. There will be marks for each lab for active participation. One Lab test to be conducted in April.
7. **Make-up Policy**
   Make-up will be granted strictly on **prior permission** only. Make-up on medical ground may be granted subject to submission of proper certificates from **Medical Officer** and concerned **Warden**. The responsibility of proving genuineness of Make-up reasons lies completely with the concerned student.
8. **Chamber Consultation Hours**: Monday 12 – 1 PM (Chamber: 6120-J)
9. **Notice**: All the notices of this course will be displayed on the **Nalanda LMS & CSIS notice boards** only.

**Instructor in Charge**
**CS F212**