Database Systems and Web (15B11CI312)

Course Description

Modules	Title of the Module	Topics in the Module
1	Introduction to Databases	Introduction to Databases, Physical Level of Data Storage, Structure of relational databases, Review of SQL Create, Insert, Update, Delete and Select Statements, Overview of NoSQL databases.
2	Database Design and ER Model	Entity type, Attributes, Relation types, Notations, Constraints, Extended ER Features
3	Relational Model and Structured Query Language	SQL: Data Definition and Data Manipulation, Relational Algebra
4	Procedural Language	PL/SQL: Stored Procedures, Functions, Cursors, Triggers

Course Description (Contd..)

Modules	Title of the Module	Topics in the Module
5	Normalisation	Data Dependencies, 2NF, 3NF, BCNF, building normalised databases
6	Transaction Management	Transactions, Concurrency, Recovery, Security
7	Web Architecture & Introduction	Motivation, characteristics and complexities of web applications, Basics, of Web Server and Application server, differences between web application and conventional software, architecture layers.
8	Client Side Web Technology	SGML, HTML 5, DHTML, CSS, Java script
9	Server Side Web Technology	PHP, Database Connectivity with PHP

Text books to be referred

1. Henry F Korth, Abraham Silberschatz, S. Sudurshan, Database system concepts, 5th Edition, McGraw-Hill,2006
2. Ramez Elmasri , Shamkant B. Navathe , Fundamentals of Database Systems, 4th Edition, Pearson Education, 2006.
3. Ramakrishnan, Gehrke, Database Management Systems, Mcgraw-Hill, 3rd Edition, Addison-Wesley,2006.
4. Thomas Connolly, Carolyn Begg, Database Systems-A Practical Approach to design, Implementation and Management, 3rd Edition, Addison-Wesley,2002.

Text books to be referred

5. “PHP and MYSQL Manual” by Simon Stobart and Mike Vassileiou
6. “PHP and MYSQL Web Development” by Luke Welling and Laura Thomson(Pearson Education)
7. “An introduction to database systems” by Bipin C. Desai, West Publishing Company, College & School Division, 1990 - Computers - 820 pages
8. Christopher J. Date, Database Design and Relational Theory: Normal Forms and All That Jazz, 2012.
9. Rajiv Chopra, Database Management System (DBMS): A Practical Approach, 5th Edition, 2016, 682 pages.

Online resource to be referred

Nptel course
DATA BASE MANAGEMENT SYSTEM,
Video Lectures by –
PROF. SAMIRAN CHATTOPADHYAY
PROF. PARTHA PRATIM DAS
Department of Computer Science and Engineering
IIT Kharagpur

available at : https://nptel.ac.in/courses/106/105/106105175/

Course objectives

COURSE OUTCOMES		COGNITIVE LEVELS
C212.1	Explain the basic concepts of Database systems and Web components.	Understand Level (Level II)
C212.2	Model the real world systems using Entity Relationship Diagrams and convert the ER model into a relational logical schema using various mapping algorithms	Apply Level (Level III)
C212.3	Develop a simple web application with client and server side scripting using Javascript and PHP and connect with a given relational database	Create Level (Level VI)
C212.4	Make use of SQL commands and relational algebraic expressions for query processing.	Apply Level (Level III)
C212.5	Simplify databases using normalization process based on identified keys and functional dependencies	Analyse Level (Level IV)
C212.6	Solve the atomicity, consistency, isolation, durability, transaction, and concurrency related issues of databases	Apply Level (Level III)

Assessment tools/Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	15
Attendance	10
Total	**100**

Database Systems and Web

Lecture 1

Contents to be covered

- Data vs. Information
- Introduction to DATABASE and Database Management Systems
- Applications of a DBMS
- Extending database capabilities for new applications
- Drawbacks of old file methods
- The advantages of DBMS
- DBMS environment

“You can have data without information, but you cannot have information without data”

- DANIEL KEYS MORAN

Data Vs. Information

- Data can be thought of as a description of the World.
- Data is a collection of facts about an entity such as values or measurements.
- It can be numbers, words, measurements, observations or even just descriptions of things.

For example : Text data (your age , phone number , cgpa etc)

Audio data (recorded songs in your mobile)

Video data (video recording of your online lectures)

Image data (your family photo)

Map data (City map of your city)

Data Vs. Information

- Information is processed , organized, useful and meaningful data.

  For example

  “6 feet” is a data whereas Jhon’s height is “6 feet” is information.

- Data is converted into information, and information is converted into knowledge.

- Knowledge: information evaluated and organized so that it can be used purposefully.

DATABASE

- Collection of related pieces of data.
- Representing/capturing the information about a real-world enterprise or part of an enterprise.
- A database is designed ,built ,populated with data for a specific purpose.
- It has intended group of users and preconceived application.
- Activities of the enterprise are supported by the database and continually update the database.

DATABASE

Example1: University Database

- Data about students, faculty, courses, laboratories, course registration/enrollment etc.
- Purpose: To keep an accurate track of the academic activities of the university.

Example2: Railways Database

- Data about trains, available or reserved seats, train routs , train number etc.
- Purpose: To keep an accurate information of the trains

More Example : Airline, glossary shop, database of satellite images etc

Database Management System(DBMS)

A software package or set of computer programs designed to store and manage databases.

DBMS tasks

- Managing large quantity of structured data .
- Efficient retrieval and modification using query processing and optimization
- Sharing data: multiple users use and manipulate data .
- Controlling the access to data: maintaining the data integrity.

Applications of a DBMS

- Banking
- Airlines
- Universities
- Telecommunication
- Finance
- Sales
- Manufacturing
- HR Management
- Many more…….

Extending Database Capabilities for New Applications

- Scientific applications

Example : use human genome or medical Database, AI based application used large database

- Storage and retrieval of images
- Storage and retrieval of videos,
- Data mining and data analytics applications
- Spatial applications
- Time series applications

Drawbacks of old file methods

- Uncontrolled Duplication: Data redundancy
  - Wastes space
  - Hard to update all files
- Inflexibility
  - Hard to change data
  - Hard to change programs
- Inconsistent data
- Limited data sharing
- Data Integrity Problems
- Concurrent-access anomalies
- Security issues

The Advantages of DBMS

- Minimal data redundancy.
- Data consistency.
- Integration of data.
- Sharing of data.
- Enforcement of standards.
- Uniform security, privacy and integrity.
- Data independence
- Ease of application development.

DBMS Environment

Reading Suggestion and image source: Elmasri and Navathe , ” FUNDAMENTALS OF DATABASE SYSTEMS”, Chapter 1

Example of DBMS

Commercial	**Open Source**
Oracle	MySQL
Microsoft SQL Server	PostgreSQL
IBM Db2	MongoDB
Microsoft Access	Redis
Splunk	Elasticsearch

General Discussion

When to use a DBMS?

&

When not to use a DBMS?

&

Can we use partial services of DBMS?