

COURSE DESCRIPTION

Dept., Number	CSC 122	Course Title	Web Database Applications
Semester hours	3	Course Coordinator	Meiliu Lu
		URL (if any):	http://gaia.ecs.csus.edu/~mei/

Catalog Description

Fundamentals of building effective database-driven web applications. Particular emphasis on database access via web interfaces. Introduction to database management systems, their structure and usage, SQL, integrating web applications with databases, design and implementation of dynamic web database applications. Prerequisites: At least a C- grade in CSC 10 or CSC 22, and in CSc 80 or equivalent.

Textbook

Luke Welling and Laura Thomson, PHP and MYSQL Web Development, 3rd Edition, Sams Publishing, 2005.

References

Selected chapters of books from Safari Tech Books Online.

Course Goals

Study various aspects of database-driven web application development that include:

1. Basic concepts of web database applications.
2. SQL, the standard relational database management system query language.
3. Entity-Relation (ER) model development and database schema design.
4. Integrating web applications with databases.
5. Web database application design principles.
6. Designing, testing, and implementing a web database application.
7. Data protection on the Web.
8. User authentication and data validation.

Prerequisites by Topic

Thorough understanding of:

- Webpage design and layout.

Basic understanding of:

- HTML and Cascading Style Sheets.
- Programming concepts and methodology including algorithm development, sequential programming, flow of control.

- File management commands in the Unix operating system.
- Web client and server software.
- Computer hardware and software, data representation, data storage.

Exposure to:

- Website design.

Major Topics Covered in the Course

1. Introduction to database-driven web applications, three-tier architectures for dynamic websites with database applications (3 hours).
2. Basic concepts of database management systems, relational models, SQL syntax, managing databases and tables, indexing, inserting, updating and deleting data, normal forms (6 hours).
3. Querying database with SQL (4 hours).
4. Web interface programming fundamentals (7 hours).
5. Object-Oriented Programming features that support web application (1 hour).
6. Generating summaries, printing and formatting strings, string manipulation functions, Date and Time functions (3 hours).
7. Copying and backing up databases, importing and exporting data (2 hour).
8. Data visualization: ER models (2 hours).
9. Essential functions for accessing database management system through web interface, web database query based on user input (3 hours).
10. Writing to web databases, server/client side data validation (3 hours).
11. Sessions, user authentication (3 hours).
12. Building practical web database applications (5 hours).
13. Case studies of real-world web database applications (3 hours).

Outcomes

Thorough understanding of:

- The lifecycle of a web database application.
- How the different parts of the three-tier architecture fit together.
- How to construct databases and tables in a database management system for web applications.
- Using Application Programming Interface (API) to access a database.
- How to combine all of the above into a working, real world application.
- How to build SELECT statements including using JOIN, GROUP BY, and other advanced SQL features.

Basic understanding of:

- The usage of database indexes to optimize performance of a web application.
- ER-model and database normalization.
- The fundamentals of a web application programming language.

- OOP as it applies in web applications development.
- Data field validation techniques.
- Sessions and basic user authentication methods (one way encryption functions).

Exposure to:

- Data warehousing concepts.
- Selected E-commerce topics such as the shopping cart architecture.
- Two way authentication methods in a web database application.

Laboratory Projects

1. Web database architecture and programming environment.
2. Given a problem that needs a web database solution, ask students to implement an application that uses a 1-table database with 2 web views – one for public and one for administration.
3. Analyze a problem and apply the appropriate methods for obtaining the solution to the problem: develop an application design that uses a multi-table database and ER model.
4. Integration of data from different data sources to generate a summary using database queries and web presentation: implement a multi-view and multi-table web database application.
5. Design and implement a practical web database application with data validation and user authentication components.

Estimated Curriculum Category Content (Semester hours)

<i>Area</i>	<i>Core</i>	<i>Advanced</i>	<i>Area</i>	<i>Core</i>	<i>Advanced</i>
Algorithms			Data Structures		
Software Design			Prog. Languages		
Comp. Arch.					

Oral and Written Communications

1. Three written reports (term project proposal, progress report, final report).
2. Two oral presentations (case study and term project).

Social and Ethical Issues

The necessity of protecting confidential data on the Web.

Theoretical Content

Database design principles.

Problem Analysis

1. External level design – web interface views for different users (for example, public user and administration user).
2. Conceptual level design – logic structure of a database (ER-diagram).
3. Internal level design – detailed schemas of a database (table definition).
4. Analysis of performance of a web database application.
5. Analysis and comparison of information retrieval processes.

Solution Design

1. External level design – web interface views for different users (for example, public user and administration user).
2. Conceptual level design – logic structure of a database (ER-diagram).
3. Internal level design – detailed schemas of a database (table definition).
4. Analysis of performance of a web database application.
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