# CIS 330: Database Management Systems

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| **Course Number & Title (A.1)** | **CIS 330: Database Management Systems** |
| **Credit Units (A.2)** | 1 CU (3 hours of lecture per week) |
| **Instructor (A.3)** | Susan Davidson Professor, susan@cis.upenn.edu, 305 Levine Hall, 215-898-3490 |
| **Text(s)/Required Materials (A.4)** | Raghu Ramakrishnan & Johannes Gehrke, *Database Management Systems* (third edition), McGraw Hill.<br>Additional materials as handouts, e.g., research papers |
| **Catalog Description (A.5a)** | Introduction to database management systems and principles of design. The Entity-Relationship model as a modeling tool. The relational model: formal languages, the industry standard SQL, relational design theory, query optimization. Storing and querying XML data. Recursive queries. Views and data integration. Overview of system level issues: physical data organization, indexing techniques, and transactions. Connecting databases to the Web. Course work requires programming in several different query languages, several written homeworks and a team project. |
| **Prerequisites (A.5b)** | Knowledge of Java programming; CIS 121 and CIS160 |
| **Course Satisfies (A.5c)** | [ ] Math [ ] Science [ ] Engineering [ x ] Technical Elective [ ] TBS **(check only one, UG curric impact only)**<br>**Elective (in a group of courses that the students must choose from)** |
| **Course Web** | http://www.cis.upenn.edu/~cis330/ |
| **Course Outcomes (A.6a)** | • Modeling relational database applications<br>• Capturing constraints in relational schemas<br>• Translating English-language statements into SQL queries against a relational database schema<br>• JDBC: Learning how to embed SQL statements in programs<br>• Physical database design: hashing, indexing, and their affect on various types of select queries, inserts and deletes.<br>• Relational algebra and calculus, expressiveness of database languages<br>• Implementing and optimizing SQL queries<br>• Using transactions for database updates; how locking is used to implement isolation levels<br>• Data security, access control and statistical databases<br>• Designing XML DTDs for modeling information<br>• Capturing constraints in XML schemas<br>• Translating English-language statements into XQuery queries against XML documents<br>• Unstructured text: Searching and ranking text documents<br>• Learning how to work in a team to design and implement a web-database application |
| **Contribution towards Program Outcomes (A.6b)** | B, C, D, G, I, J |
| **Topics Covered (A.7)** | • Overview of the relational model: relations, domain constraints, keys, foreign keys<br>• Relational algebra and calculus<br>• SQL: nested queries and aggregation<br>• JDBC: connecting databases to the web<br>• ER modeling, mapping ER designs to relations<br>• Functional dependencies, Armstrong's axioms<br>• Normalization: 3NF and BCNF<br>• File organization and indexing<br>• Query evaluation<br>• Query optimization, algebraic equivalences<br>• XML and XQuery<br>• Text and search; ranking results<br>• Transactions<br>• Security and authorization |
| **Grading Details** | 20% Homework, 20% Midterm, 30% Final, 25% Final project, 5% Participation |
| **Prepared By/Date** | Susan Davidson, January 2011 |