COURSE DESCRIPTION

This course aims to introduce advanced topics in database systems and data engineering by delving into current research in these areas. The topics to be covered include query evaluation and optimization, spatial data management, adaptive indexing in the context of modern column-stores, top-k search, skyline queries, multimedia and time-series data management.

COURSE MATERIALS

This course is not based on a specific textbook, hence has no predefined required textbook. A collection of lecture notes, readings, and research papers will be made available during the course of the semester on blackboard.

Prerequisite:
22:198:603

CLASS ORGANIZATION & ADMINISTRATION

The research paper to be submitted can belong to one of the following categories:

A. Survey paper. (Read at least 6 papers on the topic)
Use Google Scholar, ACM Portal and DBLP to find papers, focusing on those published in the following conferences: VLDB, SIGMOD, and ICDE.

scholar.google.com     portal.acm.org     www.informatik.uni-trier.de/~ley/db

Write a survey, encompassing: introduction, problem definition (including motivation and application domain), summary of techniques developed in each paper, global view of the papers covered, and future work suggestions. The length should be limited to and not exceed 6 pages in ACM conference format:

http://www.acm.org/sigs/pubs/proceed/template.html

You will be called to discuss your survey, and it will be evaluated on (a) understanding of the topic, (b) presentation and structure, and (c) critique of the research covered.

B. Own Research.
Proceed in the same manner as for Survey, identify a new research problem in the area and develop your own solution. Your work will be evaluated for originality and novelty, while in this case the comprehensiveness of survey becomes secondary.
C. Prototype Implementation.
Identify a problem and examine existing solutions, using the instructions provided above. Implement one of the solutions, as found in a rank-1 conference (i.e., VLDB, SIGMOD, ICDE) or premium journal paper (i.e., ACM TODS, VLDB Journal, IEEE TKDE). Write a 4-6 pages report, using ACM format as above. Include a discussion of the problem and the solution, and your experimental results. Try to reproduce some of the results in the paper. Submit the survey along with a zip file of your code. You will be called to demonstrate your prototype, and the work will be evaluated on (a) report quality and (b) demonstration effectiveness.

Topics for Research Paper:
Your research paper can cover any topic in current database research. Examples include query optimization, advanced spatial query processing, answering moving and continuous queries, indexing for spatial, multimedia, time-series, and graph data, spatio-textual search, time-series mining, semantic web databases, cloud computing, etc. You need to get approval on the topic and the literature studied by sending an email to karras@business.rutgers.edu, with subject: “ADB paper topic” by Sep. 19. The topic should be defined by reading materials modern and broad enough to justify the selection.

The papers will be evaluated for their breadth of coverage, comprehensibility (to non-experts), structure, timeliness (including latest developments), quality of presented material, conciseness, critical thinking, and evaluation (either self-made or by reference to credible published work).

FINAL GRADE ASSIGNMENT

- Research Paper and Presentation 40%
- 2 Written Assignments 15%
- Midterm Examination 25%
- Final Examination (follow-up on research paper) 20%
# Computer Science (26:198:641)

## COURSE SCHEDULE

| Week #1, Sep 5 | Course Overview  
Review of Database Design, Queries, Indexing |
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<td>Week #2, Sep 12</td>
<td>Query Evaluation and Optimization</td>
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| Week #3, Sep 19 | Introduction to Spatial Data Management       
Research Paper Subject **due**               |
| Week #4, Sep 26 | Spatial Indexing & Query Evaluation            |
| Week #5, Oct 3  | Top-k Search                                    |
| Week #6, Oct 10 | Skyline Queries                                |
| Week #7, Oct 17 | Adaptive Indexing and Database Cracking        |
| Week #8, Oct 24 | Introduction to Information Retrieval          |
| Week #9, Oct 31 | Indexing and Searching Multimedia and Time-series data |
| Week #10, Nov 7 | **Mid-term Exam**                               
Topics covered until Mar 12                |
| Week #11, Nov 14| Bonus lecture                                 |
| Week #12, Nov 21| No class                                      
Papers due, presentation schedule announced|
| Week #13, Nov 28| Research Paper Presentations                  |
| Week #14, Dec 5 | Research Paper Presentations                  |
| Week #15, Dec 12| Research Paper Presentations                  |