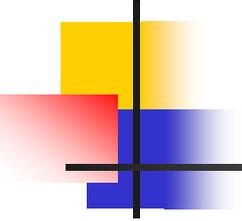


CS 306 Database Systems

Introduction

GENERAL INFORMATION



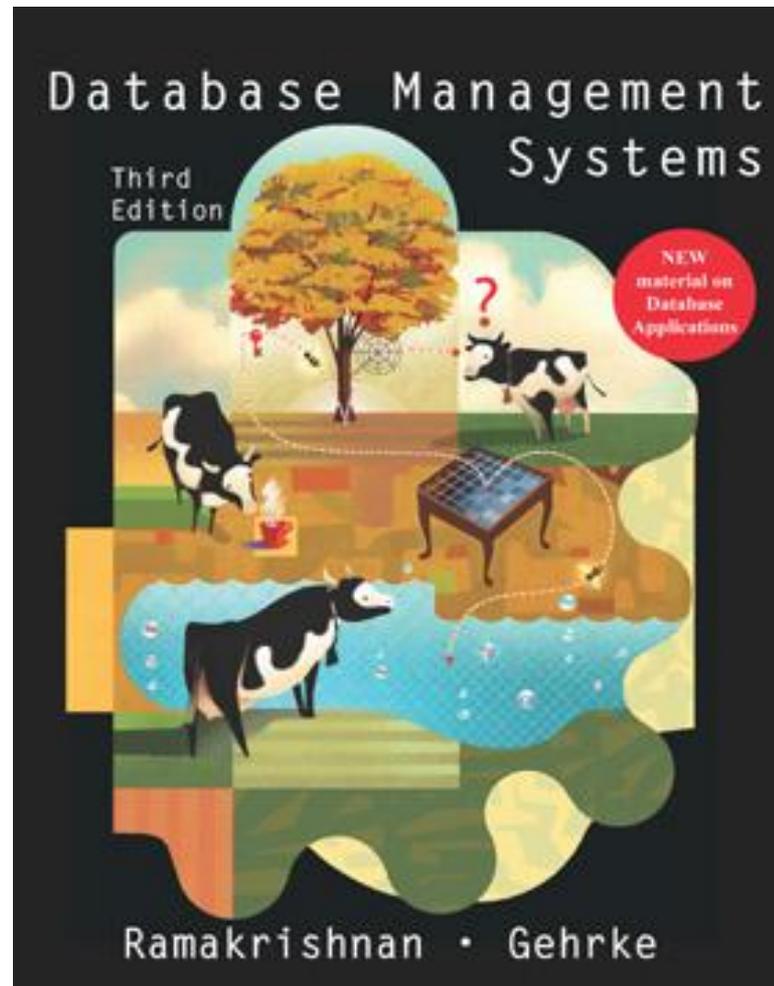
- Office : FENS 2081
- Email : ysaygin@sabanciuniv.edu
- Tel : 9576
- Web : <http://people.sabanciuniv.edu/~ysaygin/>
- Instructor Office Hours :
 - Monday 10:40-13:30
 - Thursday 11:40-14:30
 - Or by appointment
- Use sucourse for discussions regarding the course.
(Your TAs will check the messages regularly and inform me for any urgent matter)



GENERAL INFORMATION

- TAs :Barış Altop, Berkay Dinçer
- UG TA: Yağız Nizipli
- TA OFFICE HOURS :
 - Tue, Wed, Thu, Fri:....

GENERAL INFORMATION : Text Book





GENERAL INFORMATION :Grading

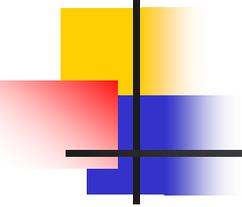
- Midterms : MT1 - 30% + MT2 - 40%
- Quizzes and HWs: 15% (5% ALS, 10% HW)
- C++/DB Implementation: 10%
- DB Application Project: 5%
 - Groups of max 4 students.
 - Different project for each group.
 - Will consist of several steps. First step is to decide what to do!
 - You may use the Oracle Database Management System to develop your database application.



PROJECT

- Form your group
- ⑩ Step 1: Write a one page report describing what you want to do for this project. For example, a library database, bank database, school database, etc. Write your report using any editor and submit it through sucourse
- ⑩ If you submit you will get 0
- ⑩ Otherwise you will get -1
- ⑩ Deadline: TBA.

An example database application



(Taken from the book “Fundamentals of Database Systems” by Elmasri and Navathe)

Company database keeps track of a company’s employees, departments and projects.

1. The company is organized into departments. Each department has a unique name, a unique number and a particular employee who manages the department. We keep track of the start date when that employee began managing the department. A department may have several locations.
2. A department controls a number of projects, each of which has a unique name, a unique number and a single location.
3. We store each employee’s name, Social Security number, address, salary, sex and birth date. An employee is assigned to one department but may work on several projects, which are not necessarily controlled by the same department. We keep track of the number of hours per week that an employee works on each project. We also keep track of the direct supervisor of each employee.
4. We want to keep track of the dependents of each employee for insurance purposes. We keep each dependent’s first name, sex, birth date and relationship to the employee.



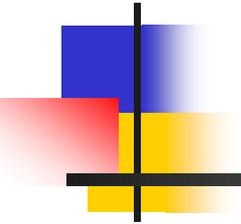
Learning objectives

- Learning how to **design and implement** a database application
 - Conceptual design (ER model)
 - Relational Model
 - Mapping ER to Relational Model
 - Schema refinement and normal forms
 - Querying (SQL)
- Learning **database system** concepts
 - Concurrency Control and Transaction Management
 - Recovery
 - Storage and Indexing



What you need to do:

- Attend the lectures! (ALSs)
- Ask any question you like during the lectures (or during my office hours)
- Don't be scared to ask questions or contribute with your comments
- Work harmoniously for the group project
- Pass this course with a good grade!
 - Min 45 out of 100
 - Please take advantage of the first midterm (it will be easier than the second midterm, and there are less topics)



INTRODUCTION TO DATABASES



Why do we need DBMSs?

- Computers were originally developed for number crunching.
- By time, data storage and processing became as important as scientific computing
- Assume that you need to store information about students, courses, and enrollment of students to courses.



Store information in files

Students.txt

00009374	Süha Orhun	Mutluergil
00011749	Francesco	Verdoja
00009054	Umut	Öztok
00010562	Selen	Başol
00010499	Ozan	Erdem
00009068	Sinan	Eğilmez
00008918	Yiğit Emin	Köksal
00008333	Kamer Ali	Yüksel
00009125	Yaşar Andaç	Efe

Query: What are names of the courses that Umut Oztok enrolled?

What are the names of students enrolled in CS201

Courses.txt

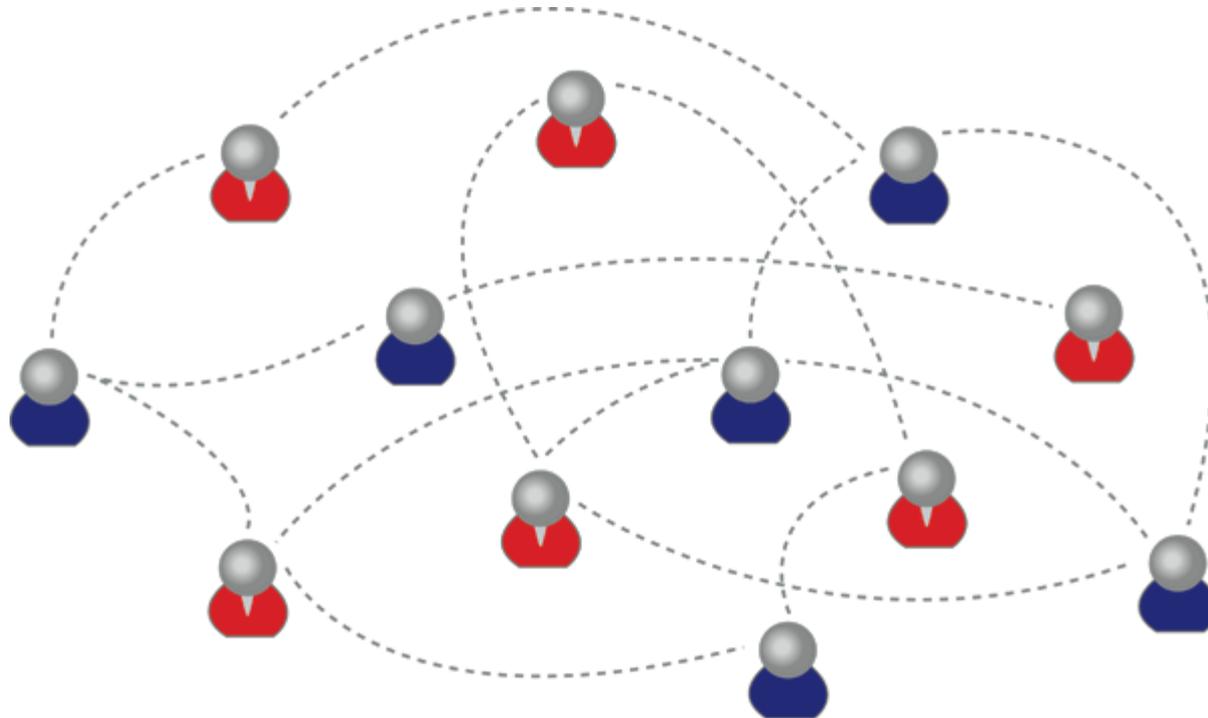
CS306	Database Systems
CS201	Intro to Comp
CS204	Advanced Prog.
MS304	Manuf Sys

Enrollment.txt

00009374	CS306
00011749	CS306
00009054	CS306
00010562	CS306
00009374	CS201
00011749	CS201
00009054	CS201
00010562	CS201



Another Example



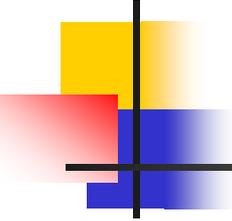
ID	NAME
1	Ahmet
2	Ali
3	Burak
4	Baha
5	Cengiz
6	Ceyda
7	John
8	Mary

ID1	ID2
1	2
1	3
2	1
2	4
3	1
3	5
4	2
5	3



Why do we need DBMSs?

- To abstract the data model and storage from querying
- Amount and types of data increased :
 - Image/audio/video data
 - Genome data
 - Customer transactions
- Database Management Systems were developed to manage this data.



A new popular term

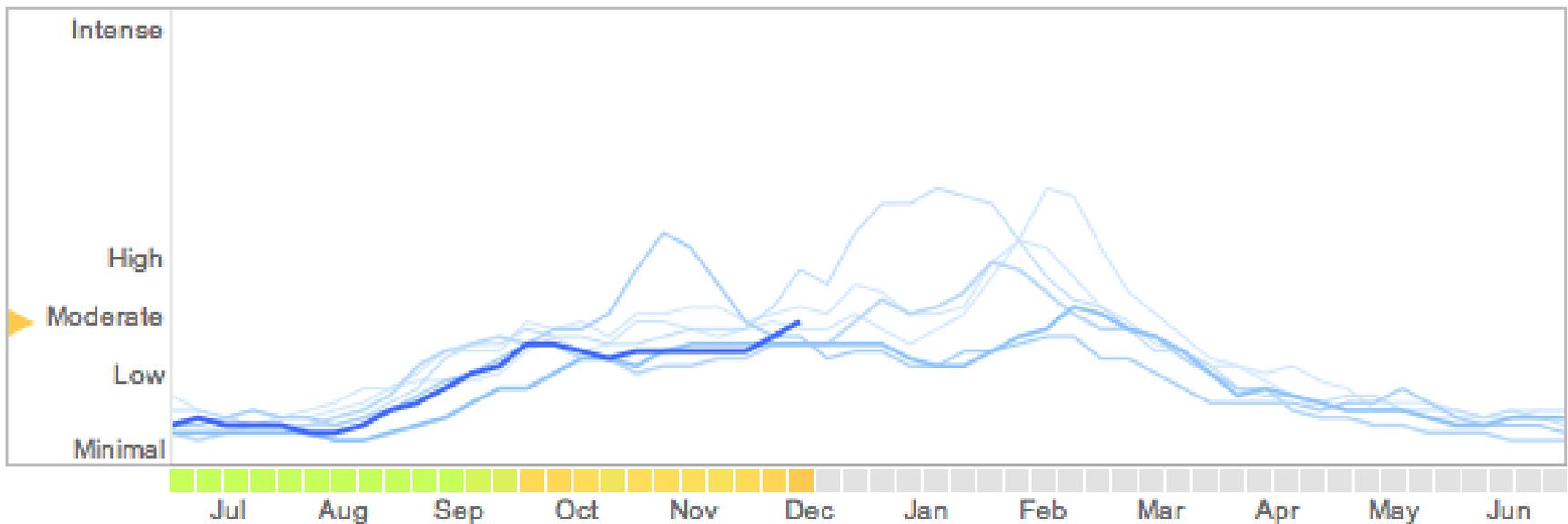
- **BIG DATA**
- Research project for you

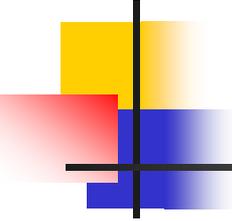
Example for Big Data

- Google Flu-Trens
 - Keyword searches
 - Number of hospital checkins with flue

National

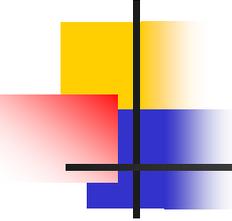
● 2012-2013 ● [Past years](#) ▼





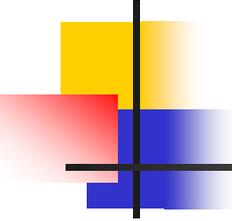
Why do we need people who know about databases?

- Most of software projects have a database component
- Someone should design the database
- Someone should maintain/tune the database
- Someone should design queries to retrieve data from the database
- Someone should deal with the recovery process when the system crashes (Ex: Customs control problems last week)



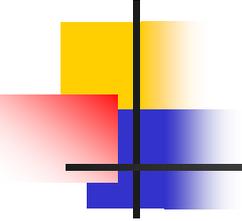
What do DBMSs do?

- They are system programs like the operating system
- Database Management Systems (DBMSs) enable us to
 - Create a database
 - Populate the database
 - Query the database
 - Let multiple users use the database at the same time
 - Recover the data when something goes wrong



What do DBMSs do?

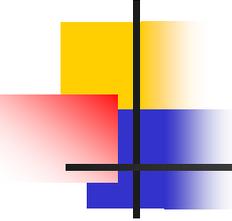
- Lets say you would like to create a database for the library:
- You need to keep information about the books and who borrowed them
- What do we need to know about a book?
 - Name
 - Author
 - Publisher
 - Year
- For each book we need to keep that information
 - Book (Name, Author, Publisher, Year)



“A Relational Model of Data for Large
Shared Data Banks”

E. F. Codd

*Communications of the ACM, Vol. 13, No. 6, June 1970,
pp. 377-387.*

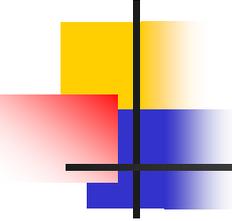


What do DBMSs do?

```
CREATE TABLE book (name CHAR(20),  
                    author CHAR(20),  
                    publisher CHAR(20),  
                    year INTEGER)
```

```
INSERT INTO book ('Kyle's Mom', 'Eric McCarthy', 'Chef', 2001)
```

Name	Author	Publisher	Year
Kyle's Mom	Eric McCarthy	Chef	2001
Death becomes him	Kenny Grave	Mr. Garrison	2000
....

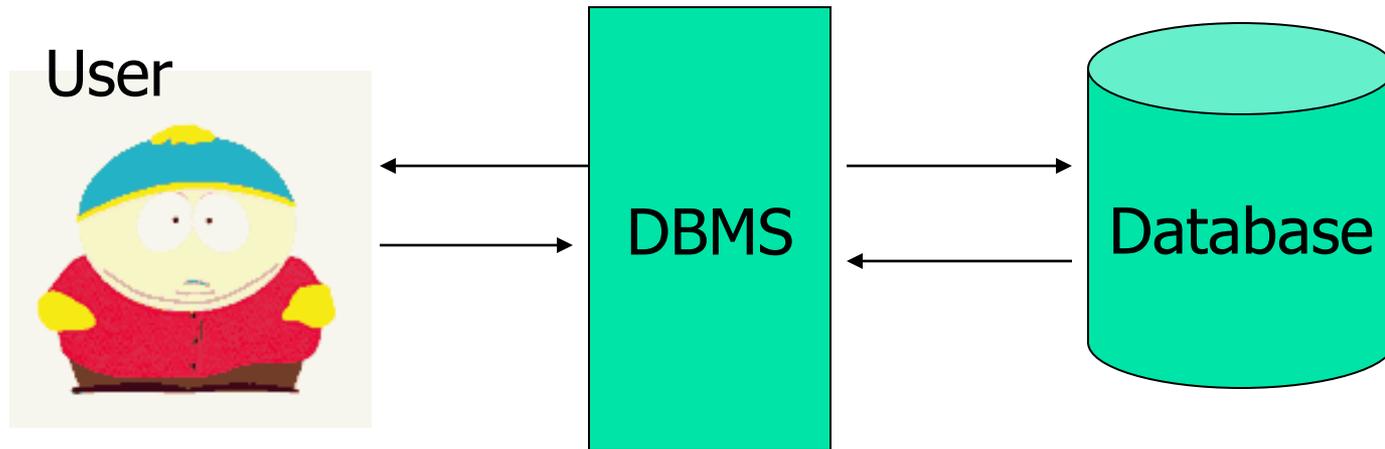


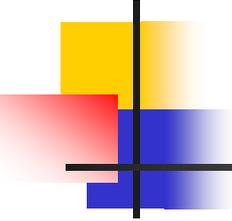
What do DBMSs do?

```
SELECT name  
FROM book  
WHERE publisher = 'Chef'
```

Name	Author	Publisher	Year
Kyle's Mom	Eric McCarthy	Chef	2001
Death becomes him	Kenny Grave	Mr. Garrison	2000
....

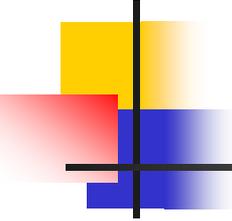
What do DBMSs do?





Syllabus

- 1. Introduction to Database Systems
- 2. Entity Relationship Model
- 3. Relational Model
- 4. Relational Algebra
- 5. SQL Queries, Embedded SQL, Triggers, and Stored Procedures



Syllabus

- 6. Schema Refinement and Normal Forms
- 7. Data Storage and Indexing
- 8. Transaction Management
- 9. Concurrency Control
- 10. Crash Recovery
- 11. Introduction to Internet Databases
- 12. Data Warehousing and Data Mining