

EE4791 Database Systems

Tutorial 1

1. For each of the following pairs of entities, indicate whether (under typical university circumstances) there is a one-to-many or a many-to-many relationship. Then using the shorthand notation introduced in the lecture, draw a diagram for each of the relationships.
 - a. STUDENT and COURSE (students register for courses)
 - b. BOOK and BOOK COPY (books have copies)
 - c. COURSE and TUTORIAL (courses have tutorial sessions)
 - d. TUTORIAL and ROOM (tutorial sessions are scheduled in rooms)
 - e. INSTRUCTOR and COURSE
2. Using the shorthand notation, draw a single diagram to represent the following situation. A BANK has one or more BRANCHes (a BRANCH always belongs to exactly one BANK). Each BRANCH may have one or more CUSTOMERs (but a CUSTOMER is assigned to only one BRANCH). Each CUSTOMER may own one or more ACCOUNTs, but each ACCOUNT is owned by only one CUSTOMER. Each CUSTOMER may submit one or more TRANSACTIONs (but each TRANSACTION is submitted by only one CUSTOMER). Finally, each ACCOUNT may have one or more TRANSACTIONs, and a TRANSACTION may be for one or more ACCOUNTs.
3. The Mountain View Hospital has a relational database. Three of the tables are shown below.
 - a. What data cannot be effectively handled by this database? What database will be good at handling these data?
 - b. Draw a diagram showing relationships among the entities.
 - c. Specify meta-data for this database.

PATIENT

Patient Number	Family Name	Given Name	Address
1135	Li	Jet	#5 BLK 5
4467	Chua	Jian	7 Lorong Ree
4238	Dolan	Mark	818 River Run
6893	Chee	Keong	8 Ka Street
9734	Wa	Wee	9 Bee Road

CHARGE

Item Code	Description	Charge
200	Room Semi Priv	800
350	Speech Therapy	750
275	Radiology	150
400	Physical Therapy	800
500	EKG Test	200
700	EEG Test	200
820	Room Priv	1000

PATIENT CHARGES

Patient Number	Item Code	Units
4238	200	2
1135	400	3
4238	275	1
4467	700	1
6893	820	3
4238	700	1
6893	500	2

d. Complete the Patient-Bill view with data.

Patient Name: Dolan, Mark

Patient Number:

Patient Address:

Item Code	Item Description	Amount

Total:

e. Draw a single E-R diagram for the entire Hospital database using the following facts:

- A HOSPITAL has on its staff one or more PHYSICIANS. A PHYSICIAN is on staff of only one HOSPITAL.
- A PHYSICIAN may admit one or more PATIENTs. A PATIENT is admitted by only one PHYSICIAN.
- A PATIENT may incur one or more charges. A charge may be incurred by any number of PATIENTs.
- A HOSPITAL may have one or more WARDS. A WARD is located in exactly one HOSPITAL.
- A WARD may have one or more NURSEs. Each NURSE may work in one or more WARDS.

EE4791 Database Systems
Tutorial 2 Questions

1. Draw an ER diagram for each of the following situations (if you believe that you need to make additional assumptions, clearly state them for each situation):

- a. A company has a number of employees. The attributes of EMPLOYEE include Employee_ID (identifier), Name, Address, and Birthdate. The company also has several projects. Attributes of PROJECT include Project_ID (identifier), Project_Name, and Start_Date. Each employee may be assigned to many projects, or may not be assigned to a project. A project must have at least one employee assigned, and may have any number of employees assigned. An employee's billing rate may vary by project, and the company wishes to record the applicable billing rate (Billing_Rate) for each employee when assigned to a particular project.
- b. Customers are served by various salespersons in a store. We need to record customer information, salesperson information, and the date for each service.
- c. Customers buy goods in a store through various salespersons. We need to record information on customers, salespersons, and goods, as well as the date for each sale.
- d. A college course may have one or more scheduled tutorial sessions, or may not have a scheduled tutorial session. Attributes of COURSE include Course_ID, Course_Name, and Units. Attributes of TUTORIAL include Tutorial_Number, Semester, and Year. Tutorial_Number is an integer (such as "1" or "2") that distinguishes one tutorial session from another for the same course but does not uniquely identify a tutorial session of a course from tutorial sessions of other courses.

2. The figure below shows a Grade Report that is mailed to students at the end of each semester. Prepare an ER diagram reflecting the data contained in the Grade Report. Assume that each course is taught by one instructor only.

Millennium College
Grade Report
Semester 2, 2012

Name:	Jane Chou	ID: 256897545
Address:	209 Brooks Hill Road	
Major:	Information Systems	

Course ID	Title	Instructor	Instructor Office	Grade
IS350	Database II	John Wayne	S1-202	A
IS101	Computing	Mary Lim	S2-102	B

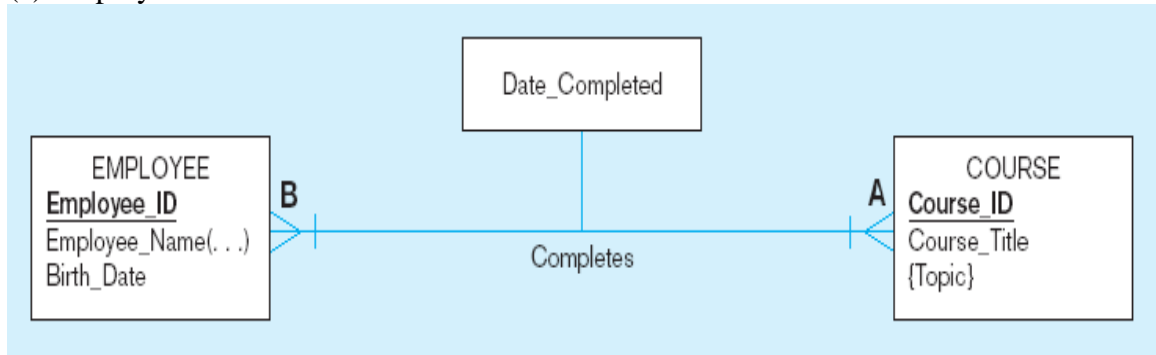
3. Prepare an ER diagram for a real estate firm that lists property for sale. The following describes this organization:

- The firm has a number of sales offices in several states. The database needs to record Office_Number (identifier) and Location of each sales office.
- Each sales office may be assigned many employees. The database needs to record the Employee_ID (identifier) and Employee_Name for each employee. An employee must be assigned to only one sales office.
- For each sales office, there is always one employee assigned to manage that office. An employee may manage only the sales office to which he is assigned.
- The firm lists properties for sale. The database needs to record the Property_ID (identifier), Address, City, State, and Post_Code for each property.
- Each property must be listed with one (and only one) of the sales offices. A sales office may have any number of properties listed, or may have no properties listed.
- Each property has one or more owners. The database needs to record the Owner_ID (identifier) and Owner_Name for each owner. An owner may own one or more properties. An owner may own a certain percentage of a property (Percent_Owned).

EE4791 Database Systems Tutorial 3 Questions

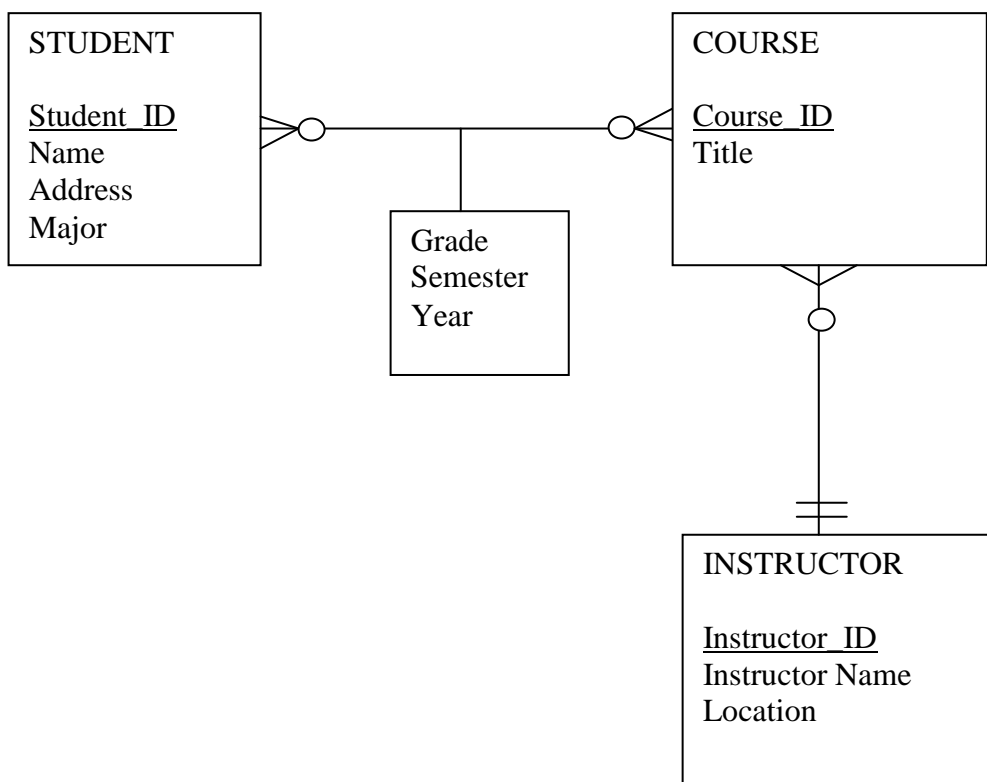
1. Transform each entity-relationship (ER) model (diagram) to a relational model (relational schema) that shows referential integrity constraints.

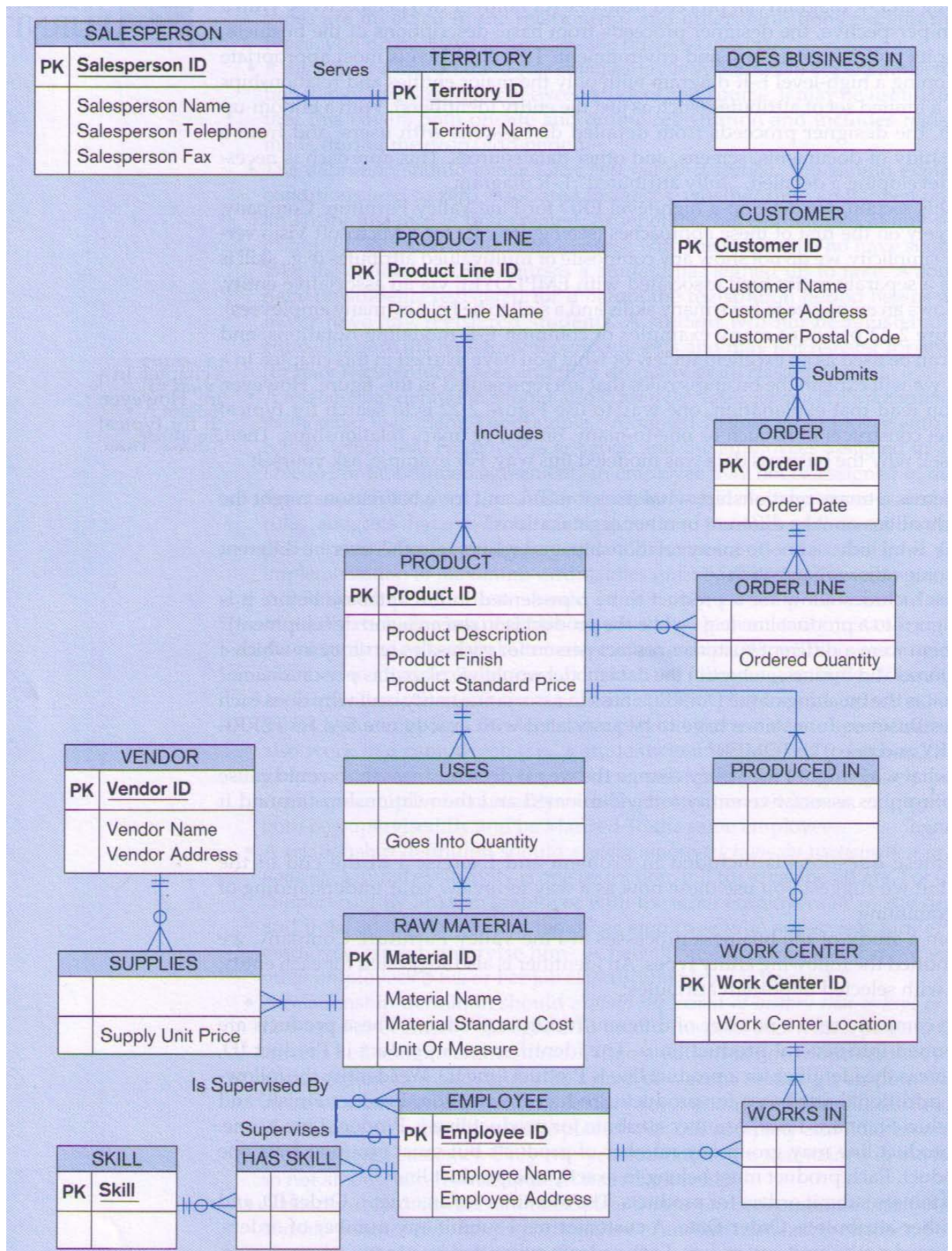
(a) Employee-Course



(b) Pine Valley Furniture model (see attached figure)

(c) Millennium College





EE4791 Database Systems
Tutorial 4 Questions

1. Consider the relation $R(A, B, C, D)$ with sample data given in the figure below:

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
<i>x</i>	<i>u</i>	<i>x</i>	<i>y</i>
<i>y</i>	<i>x</i>	<i>z</i>	<i>x</i>
<i>z</i>	<i>y</i>	<i>y</i>	<i>y</i>
<i>y</i>	<i>z</i>	<i>w</i>	<i>z</i>

Determine which of the following functional dependencies do **not** hold:

$A \rightarrow B$, $A \rightarrow C$, $B \rightarrow A$, $D \rightarrow C$, $C \rightarrow D$, $D \rightarrow A$.

2. For each of the following relations, indicate the normal form for that relation. If the relation is not in 3NF, decompose it into 3NF relations. Functional dependencies (other than those implied by primary keys) are shown where appropriate.

a) CLASS(CourseID, SectionID).

b) CLASS(CourseID, SectionID, Room).

c) CLASS(CourseID, SectionID, Room, Capacity).

Room \rightarrow Capacity

d) CLASS(CourseID, SectionID, CourseName, Room, Capacity).

Room \rightarrow Capacity,

CourseID \rightarrow CourseName

3. Given the following relation:

Employee_Project (EmpID, ProjectID, EmpName, DeptID,
DeptName, ProjectTitle, ProjectHours)

where Emp, Dept and ID are the short forms for Employee, Department and Identifier, respectively, and ProjectHours is the accumulative hours spent by an employee on a project.

- (a) List or indicate all functional dependencies other than those implied by primary keys.
- (b) Is it in 2NF or 3NF? Explain why.
- (c) If the relation is not in 3NF, normalize it to 3NF.

4. An insurance company intends to set up a database for keeping records on its employees, policy holders, various kinds of policies, and claims that have been made. The database is to contain the following data:

- For each department: department ID, department name.
- For each employee: employee ID, name, salary. Each employee works in only one department.
- For each policy-holder: policy-holder ID, name, address, date of birth.
- For each claim: claim ID, claim date, process date.

There are only three kinds of policies: Life, Fire and Motor Vehicle. Every policy has a policy ID, effective date, maturity date, premium amount, and amount insured. In addition, a life policy carries a bonus payment, a fire policy must have the address of the insured property and a motor vehicle policy needs the vehicle ID.

A policy holder may have one or more policies but each policy has only one policy holder. A policy or claim is handled by only one employee. A claim can involve only one policy but one policy may have multiple claims.

- (a) Identify all the entities and relationships. Draw an ER diagram for this problem.
- (b) Transform the ER diagram into a set of relations and normalize the relations to the third normal form. Indicate all primary keys, foreign keys, and referential integrity.

EE4791 Database Systems
Tutorial 5 Questions

1. Contrast the following terms:

- a) base table; view
- b) catalog; schema
- c) where clause; having clause

2. Explain how a view can be used to reinforce data security.

3. Consider the database tables defined below:

Student (StudentID, StudentName);

Lecturer (LecturerID, LecturerName);

Course (CourseID, CourseName);

Tutorial (TutorialID, CourseID);

IsQualified (LecturerID, CourseID, DateQualified);

IsRegistered (StudentID, TutorialID, Semester);

Assumption: all IDs are numeric except for course ID, which should be alphanumeric.

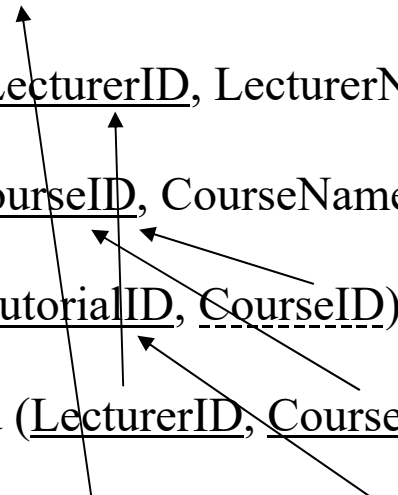
Write SQL commands for the following requirements.

- a. Define the tables for Student, Course, Tutorial, and IsRegistered.
- b. List the course ID and course name for all courses with an 'ISM' prefix.
- c. Define a view (a student list) for all students registered in semester I-98.
- d. Find which lecturers are qualified to teach ISM 3113 before 01-JAN-2000.
- e. Find any lecturers who can teach both ISM 3113 and ISM 3114.
- f. Find out how many students are enrolled in Tutorial 2714 during semester I-98.
- g. Find out how many students are enrolled during semester I-98.
- h. Insert a student 'Joe Sun' with student ID '98765' into the database.

EE4791 Database Systems
Tutorial 6 Questions

1. Consider the database tables below as in Tutorial 5 Question 3. Write SQL commands for the additional requirements stated below.

Student (StudentID, StudentName);
Lecturer (LecturerID, LecturerName);
Course (CourseID, CourseName);
Tutorial (TutorialID, CourseID);
IsQualified (LecturerID, CourseID, DateQualified);
IsRegistered (StudentID, TutorialID, Semester);



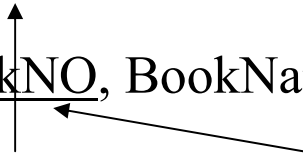
- (a) List all courses (and course details) for which Professor John Tan has been qualified.
- (b) Find the IDs of any lecturers who are qualified to teach ISM3113 but not qualified to teach ISM3114.
- (c) Find out how many students are enrolled in course ISM3113 during semester I-98.
- (d) Find out which students were not enrolled in any courses during semester I-98. Show their IDs and names.

2. Given a library database with the following relations:

Reader (ReaderID, ReaderName, Rating)

Book (BookNO, BookName, Color)

Reserve (ReaderID, BookNO, Date)



Provide SQL statements to:

(a.1) Create a view RReader to include those readers (reader IDs and names) who have a rating 2 or less and those readers who have reserved more than two different books.

(a.2) Create a view RReader to include those readers (reader IDs and names) who have a rating 2 or less and ~~those readers who~~ have reserved more than two different books.

(b) Add a new column Author to the Book table.

(c) Record the following reservations in the database.

On 1-Mar-02, Reader R1 reserved books B5 and B6.

(d.1) List the IDs of the readers who have reserved a blue book.

(d.2) List the names of the readers who have reserved a blue book.

(e1) Find the number of blue books.

(e2) For each book, find the number of reservations for this book.

(e3) For each blue book, find the number of reservations for this book.

(f) Find the names and ratings of persons who have reserved two or more (different) books on the same date.

(g1) Find the names of readers who have reserved a blue or a black book.

(g2) Find the names of readers who have reserved both a blue and a black book.

(h) Remove those reserve records older than 31-Jan-02.

(i) Update Author column to '****' for those books