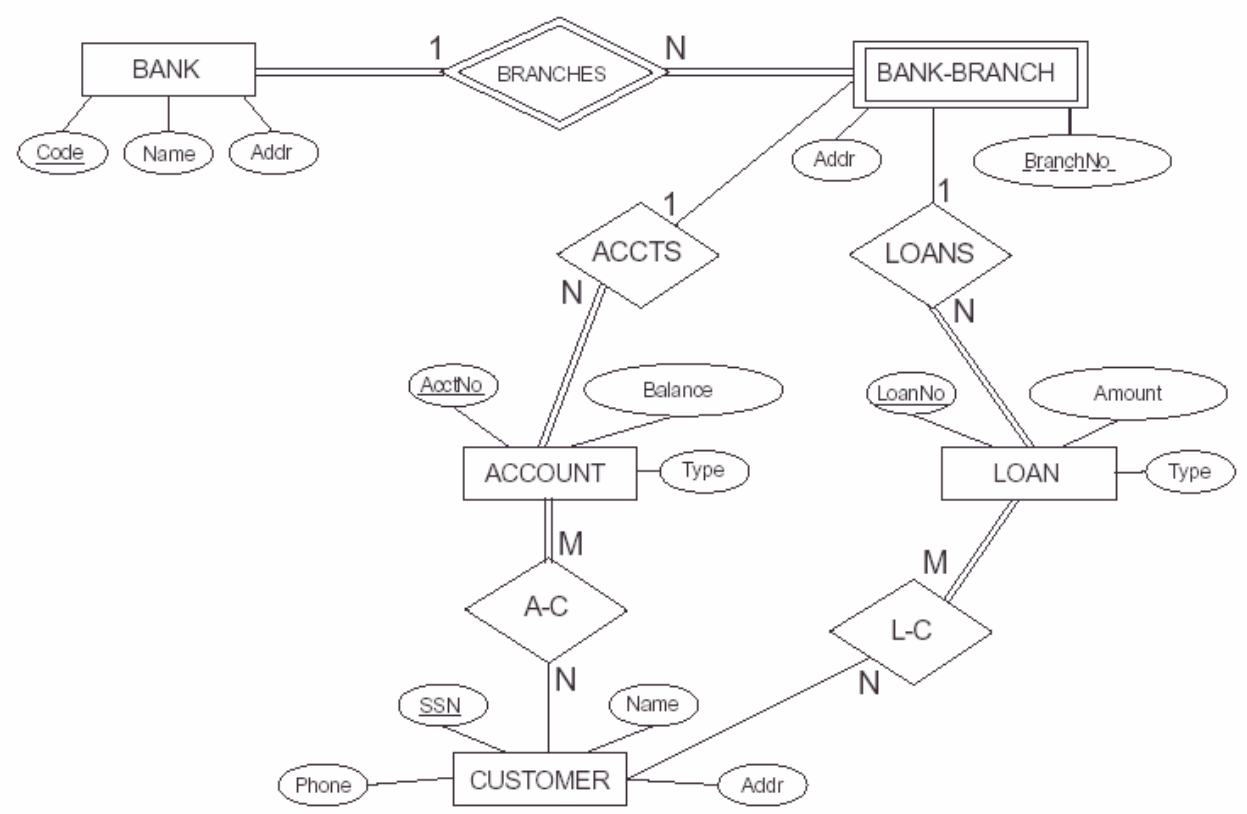
CS 327 Spring 2025

Class Practice

The ER and EER models.

EXERCISE 1.

Consider the ER diagram shown in the following figure for part of a BANK database. Each bank can have multiple branches and each branch can have multiple accounts and loans.



a. List the (non-weak) entity types in the ER diagram.

b. Is there a weak entity type? If so, give its name, partial key, and identifying relationship.

c. What constraints do the partial key and the identifying relationship of the weak entity type specify in the diagram?

d. List the names of all relationship types, and specify the (min, max) constraint on each participation of an entity type in a relationship type. Justify your choice.

e. List concisely the user requirements that led to this ER schema design.

f. Suppose that every customer must have at least one account but is restricted to at most two loans at a time, and that a bank branch cannot have more than 1000 loans. How does this show up on the

(min, max) constraints?

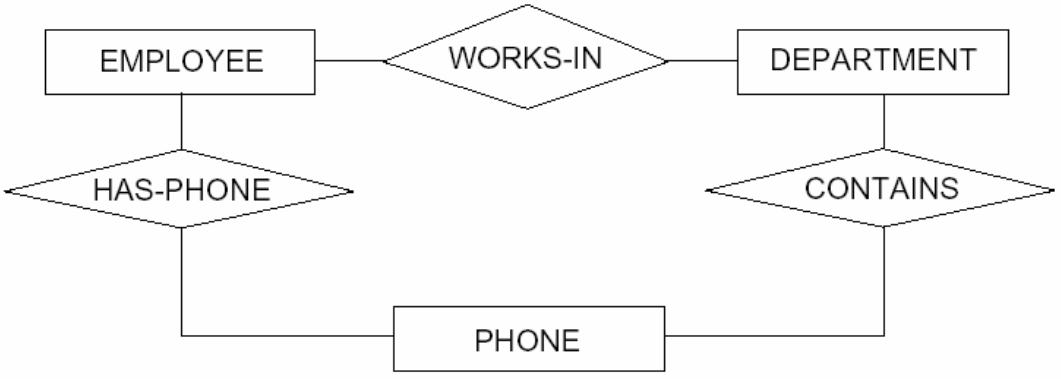
EXERCISE 2.

Consider the ER diagram of the following figure. Assume that an employee may work in up to two departments, but may also not be assigned to any department. Assume that each department must have one and may have up to three phone numbers.

1. Supply on this diagram (a) participation and cardinality constraints and (b) (min, max) constraints. *State clearly any additional assumptions you make.*

2. Under what conditions would the relationship HAS_PHONE be redundant in the above example?

An ER diagram for a database that keeps track of company and employee phones.

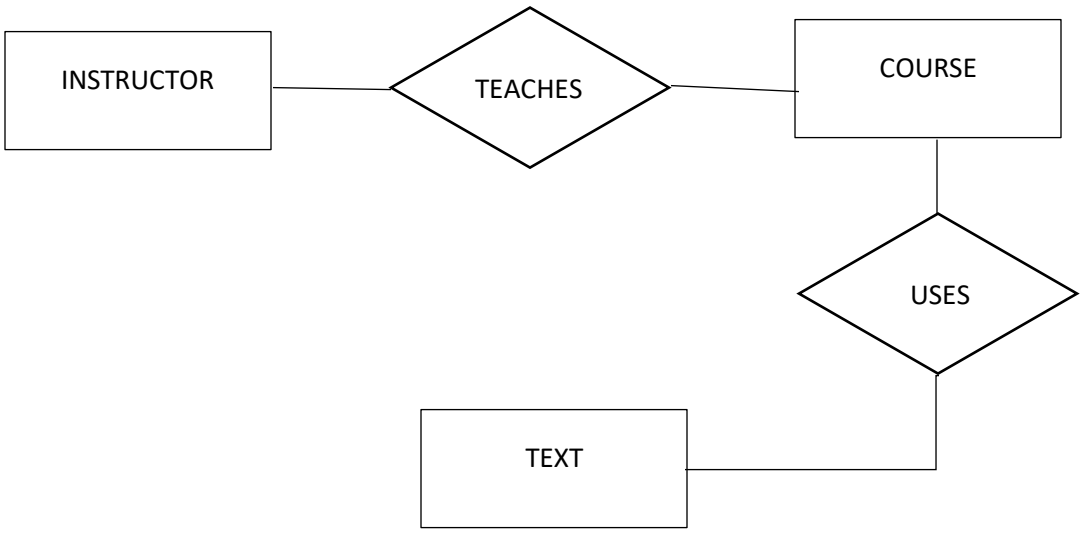


EXERCISE 3.

Consider the ER diagram of the following figure. Assume that a course may or may not use a textbook, but that a text by definition is a book that is used in some course. A course may not use more than five books. Instructors teach from two to four courses.

1. Supply for this diagram: (a) participation and cardinality constraints, and (b) (min, max) constraints. *State clearly any additional assumptions you make.*

2. If we add the relationship ADOPTS between INSTRUCTOR and TEXT what (min, max) constraints would you put on it? Why?



EXERCISE 4.

A university database contains information about professors (identified by social security number, or SSN), and courses (identified by courseID). Professors teach courses; each of the following situations concerns the Teaches relationship set. For each situation, draw an ER diagram that describes it (assuming that no further constraints hold).

1. Professors can teach the same course in several semesters, and each offering must be recorded.
2. Professors can teach the same course in several semesters, and only the most recent such offering need to be recorded. (Assume this condition applies to all subsequent questions.)
3. Every professor must teach some course.
4. Every professor teaches exactly one course (no more, no less).
5. Every professor teaches exactly one course (no more, no less), and every course must be taught by some professor.
6. Now suppose that certain courses can be taught by a team of professors jointly but, but it is possible that no one professor in a team can teach the course. Model this situation, introducing additional entity types and relationship types if necessary.