



King Saud University
College of Computer and Information Sciences
Computer Science Department

CSC380
Fundamentals Of Database Systems

Tutorial#2

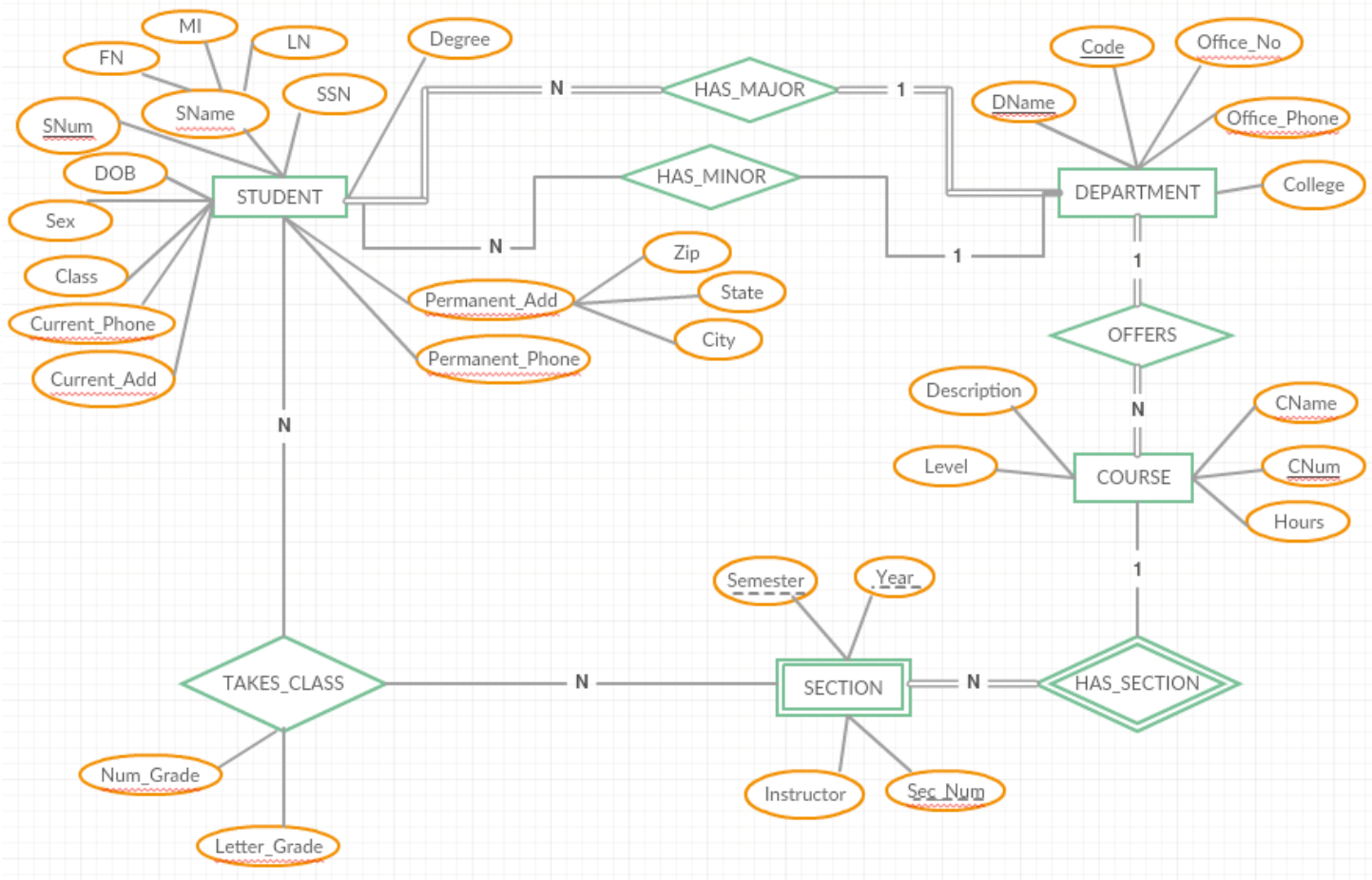
1. Consider the following set of requirements for a UNIVERSITY database that is used to keep track of students' transcripts. This is similar but not identical to the database shown in Figure 1.2:

- a. The university keeps track of each student's name, student number, social security number, current address and phone, permanent address and phone, birth date, sex, class (freshman, sophomore, ..., graduate), major department, minor department (if any), and degree program (B.A., B.S., ..., Ph.D.). Some user applications need to refer to the city, state, and zip of the student's permanent address, and to the student's last name. Both social security number and student number have unique values for each student.
- b. Each department is described by a name, department code, office number, office phone, and college. Both name and code have unique values for each department.
- c. Each course has a course name, description, course number, number of semester hours, level, and offering department. The value of course number is unique for each course.
- d. Each section has an instructor, semester, year, course, and section number. The section number distinguishes different sections of the same course that are taught during the same semester/year; its values are 1, 2, 3, ..., up to the number of sections taught during each semester.
- e. A grade report has a student, section, letter grade, and numeric grade (0, 1, 2, 3, 4 for F, D, C, B, A, respectively).

Design an ER schema for this application, and draw an ER diagram for that schema. Specify key attributes of each entity type and structural constraints on each relationship type. Note any unspecified requirements, and make appropriate assumptions to make the specification complete.



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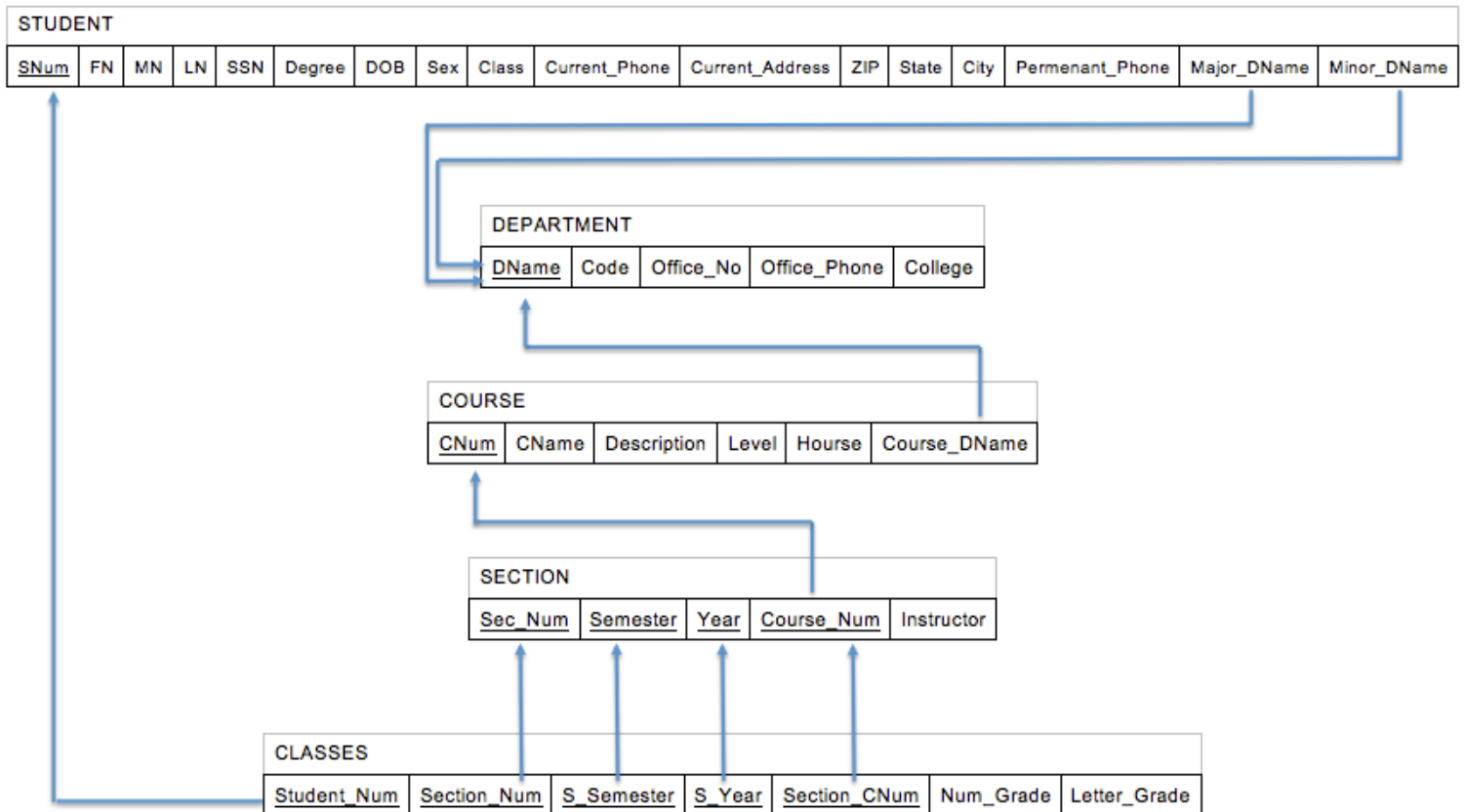


Assumptions:

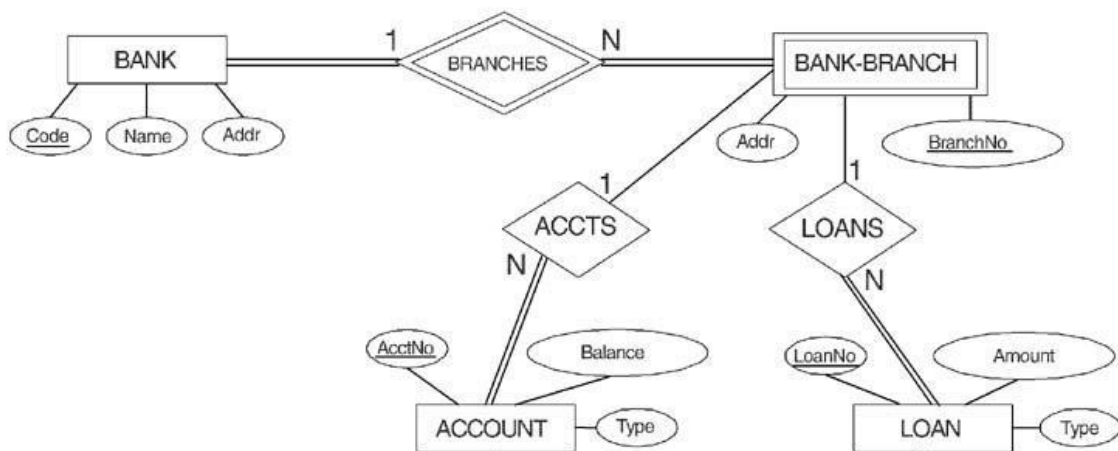
- Every department must have at least one student enrolled in it as a major
- A student must specify his major when he/she joins the university
- Not all departments are used as a minor department for a student's degree
- Every department must offer at least one course
- Every course must belong to exactly one department
- Not all courses will have sections (a course may be new and will not be offered until next year, or there is no instructor available to teach the course)
- A section may not have any students enrolled in it
- A student may not sign up for any classes (sections) (for example, the student dropped that semester for medical reasons)



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





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a. List the strong (non-weak) entity types in the ER diagram.
BANK, ACCOUNT, CUSTOMER, LOAN.

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

Weak entity type: BANK-BRANCH.

Partial key: BranchNo.

Identifying relationship: BRANCHES.

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

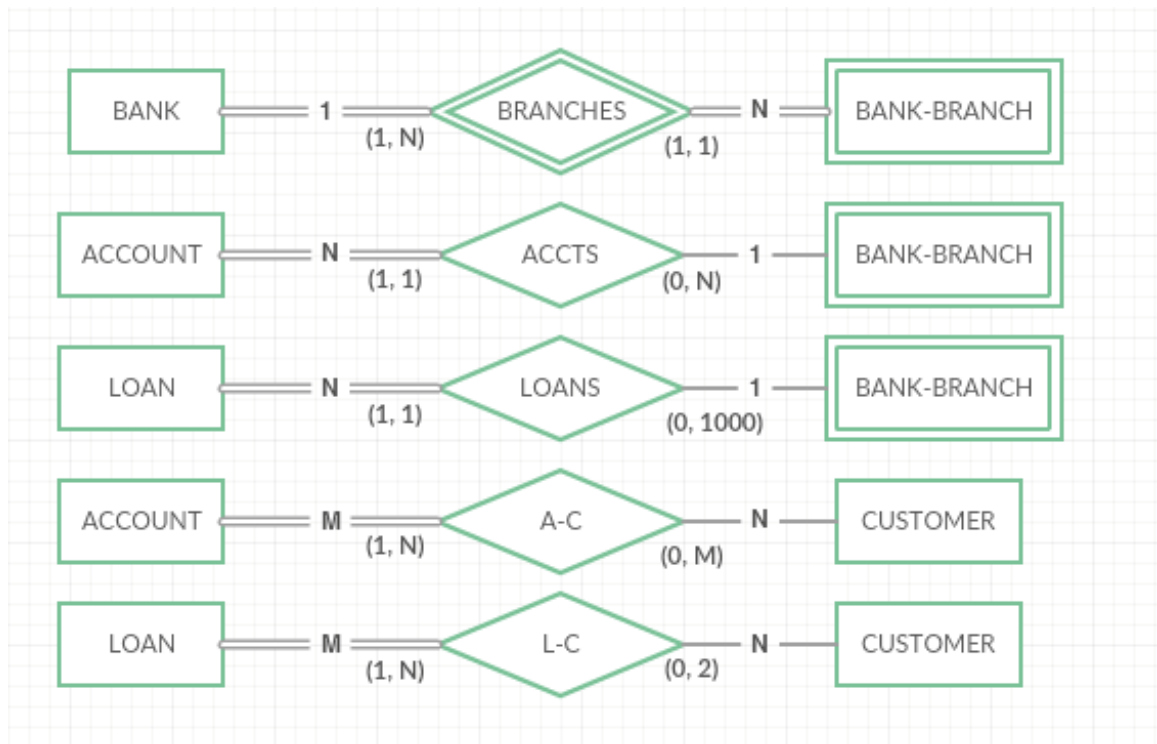
- The partial key BranchNo in BANK-BRANCH specifies that the same BranchNo value may occur under different BANKs.
- The identifying relationship BRANCHES specifies that BranchNo values are uniquely assigned for those BANK-BRANCH entities that are related to the same BANK entity.
- Hence, the combination of BANK Code and BranchNo together constitute a full identifier for a BANK-BRANCH.



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- 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. Assume that a customer may have a maximum of 2 loans and that a maximum of 1000 loans are allowed per branch.



- e. List concisely the user requirements that led to this ER schema design.
- Each **BANK** has a unique Code, as well as a Name and Address.
 - Each **BANK** must have one or more **BANK-BRANCH**s, and the BranchNo is unique among each set of **BANK-BRANCH**s that are related to the same **BANK**.
 - Each **BANK-BRANCH** has an Address.
 - Each **BANK-BRANCH** may have several **LOAN**s and may have several **ACCOUNT**s.
 - Each **ACCOUNT** has a unique AcctNo, Balance, and Type and must be related to exactly one **BANK-BRANCH**.
 - Every **ACCOUNT** must be associated with at least one **CUSTOMER**.



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- Each LOAN has a unique LoanNo, Amount, and Type and must be related to exactly one BANK-BRANCH
- Every LOAN must be associated with at least one CUSTOMER.
- Each CUSTOMER has a unique SSN, Name, Phone, and Address, and may have several ACCOUNTs and may have several LOANs.