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CET2002B Database Management Systems

**School of Computer Engineering and
Technology**

CET2002B Database Management Systems

Course Objectives:

- 1) Understand and successfully apply logical database design principles, including E-R diagrams and database normalization.
- 2) Learn Database Programming languages and apply in DBMS application
- 3) Understand transaction processing and concurrency control in DBMS
- 4) Learn database architectures, DBMS advancements and its usage in advance application

• Course Outcomes:

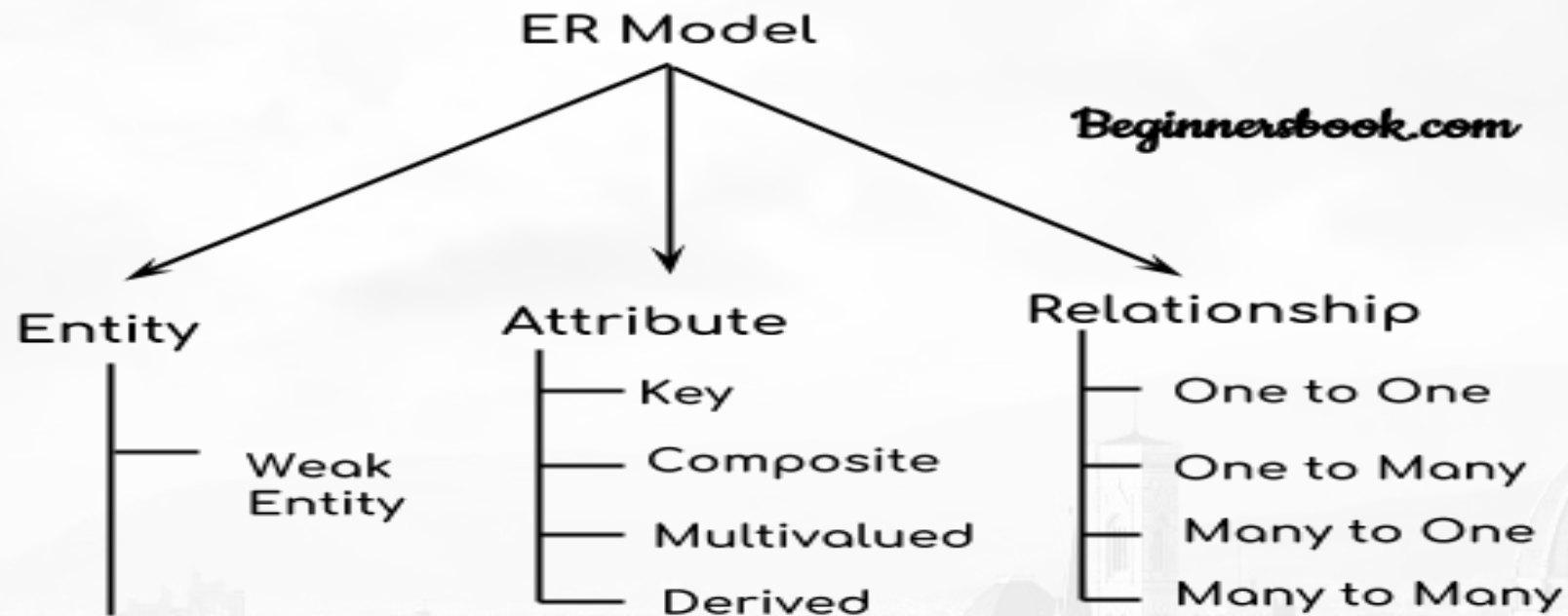
- 1) Design ER-models to represent simple database application scenarios and Improve the database design by normalization.
- 2) Design Database Relational Model and apply SQL , PLSQL concepts for database programming
- 3) Describe Transaction Processing and Concurrency Control techniques for databases
- 4) Identify appropriate database architecture for the real world database application



Case Study on ER

LABORATORY ASSIGNMENT NO: 01

ER Diagram Components



Components of ER Diagram

ER- Diagram Notations

ER- Diagram is a visual representation of data that describe how data is related to each other.

- **Rectangles:** This symbol represent entity types
- **Ellipses :** Symbol represent attributes
- **Diamonds:** This symbol represents relationship types
- **Lines:** It links attributes to entity types and entity types with other relationship types
- **Primary key:** attributes are underlined
- **Double Ellipses:** Represent multi-valued attributes



Basic E-R Notation

Entity
symbols

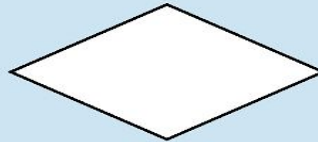
Basic symbols



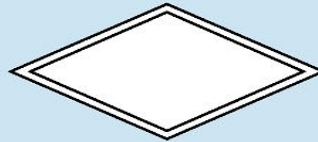
Strong entity



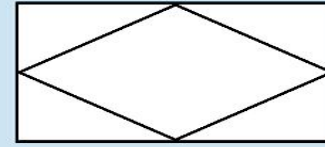
Weak entity



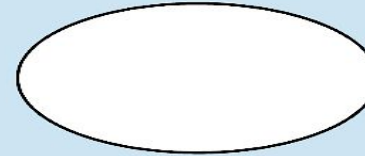
Relationship



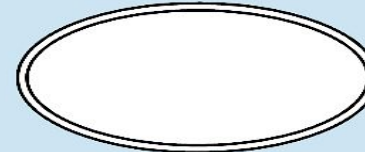
Identifying relationship



Associative entity



Attribute



Multivalued attribute



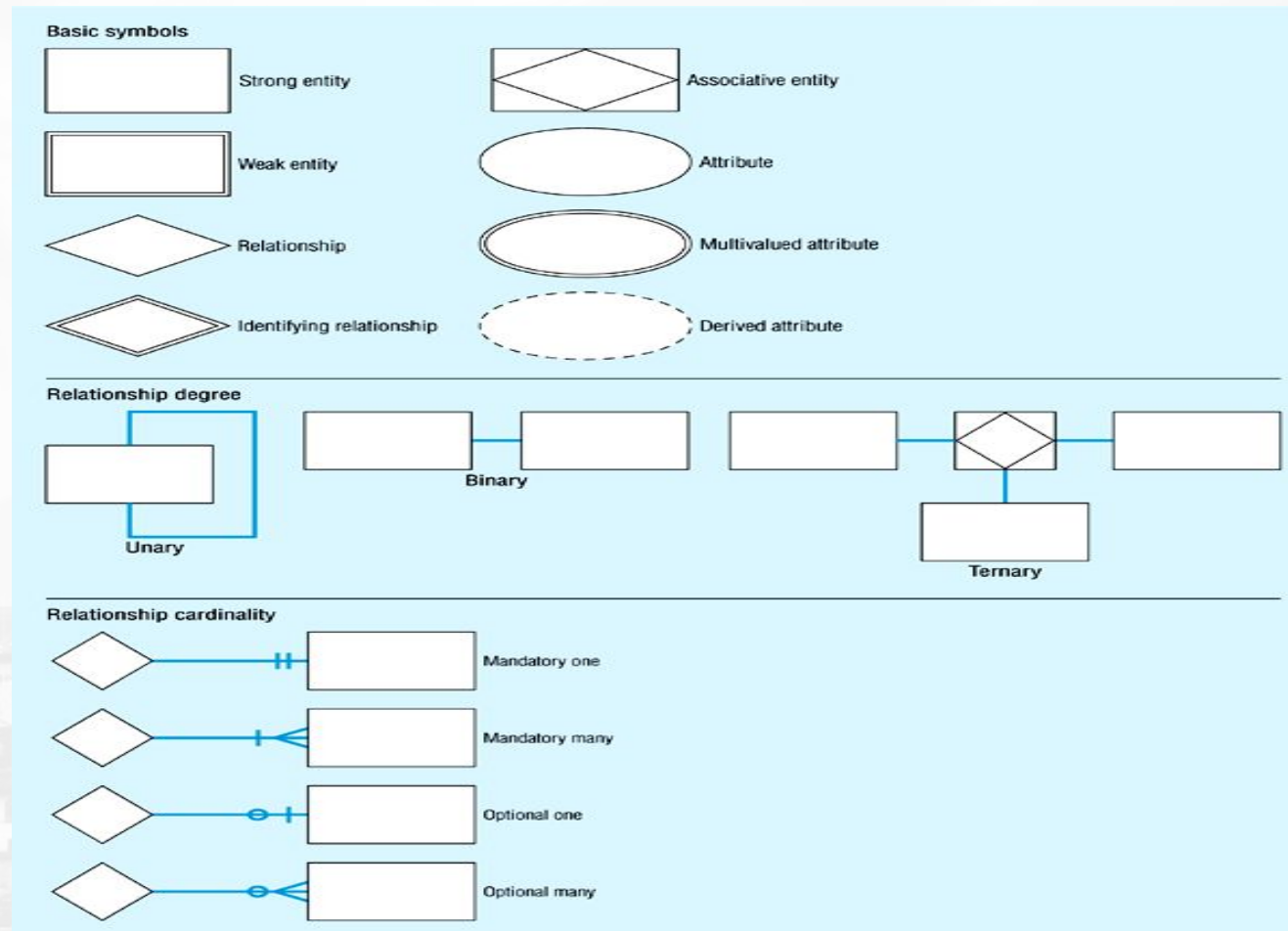
Derived attribute

A special entity
that is also a
relationship

Attribute
symbols

Relationship
symbols

Basic E-R Notation



Steps in designing an ERD for a DBMS

There are four steps in designing an ERD for a DBMS .

- Identify Entity and members
- Decide relationships and Cardinality and Modality
- Draw Entities separately
- Connect relationships and entities

Step by Step ERD Example

A University contains many Faculties. The Faculties in turn are divided into several Schools. Each School offers numerous programs and each program contains many courses. Lecturers can teach many different courses and even the same course numerous times. Courses can also be taught by many lecturers. A student is enrolled in only one program but a program can contain many students. Students can be enrolled in many courses at the same time and the courses have many students enrolled.

Step 1 - Identify Entities

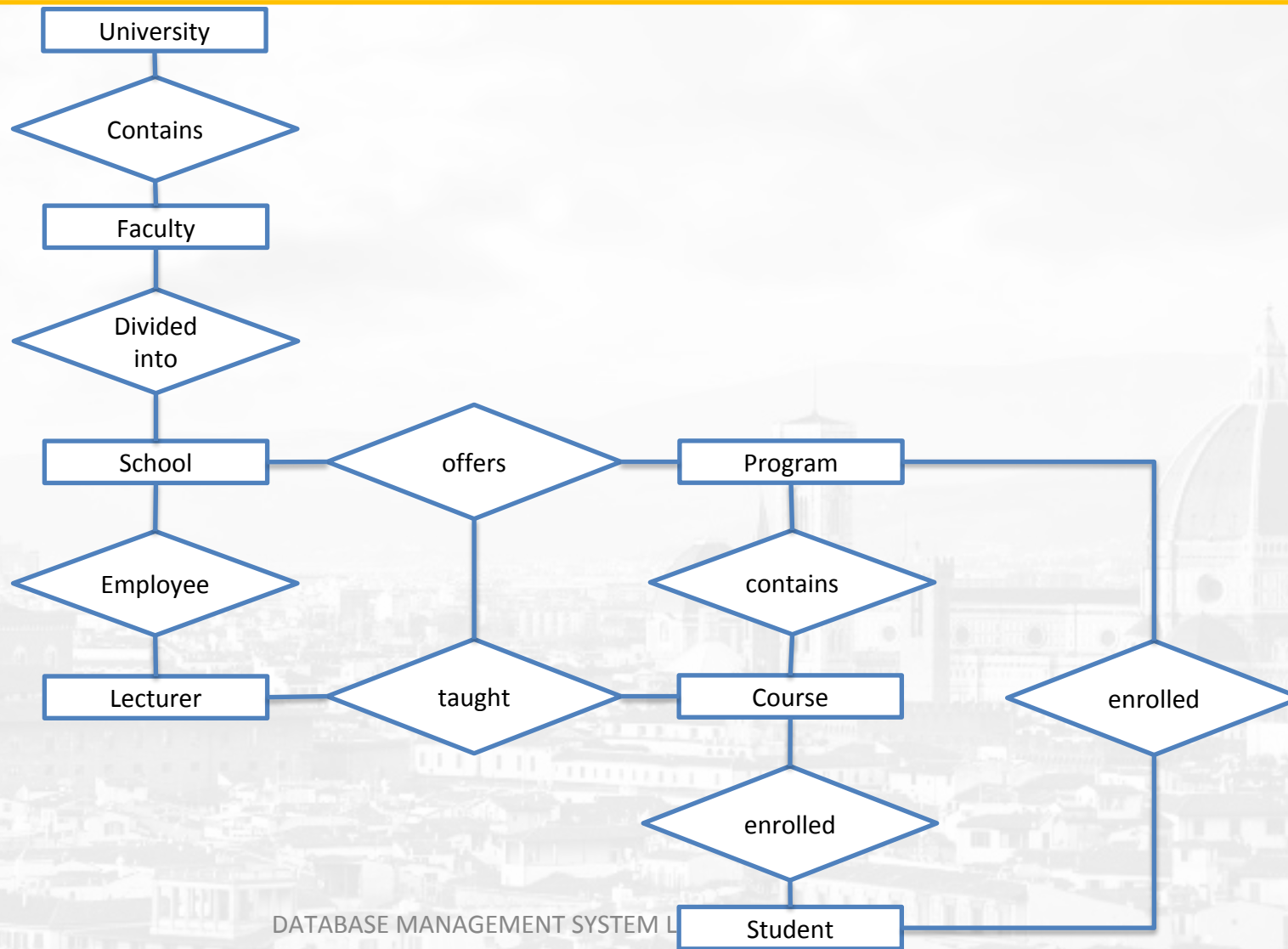
- The entities in this scenario are
 - University
 - Faculty
 - School
 - Program
 - Course
 - Lecturer
 - Student

Step 2 - Find relationships

	University	Faculty	School	Program	Course	Lecturer	Student
University		contains					
Faculty			divided Into				
School				offers		employs	
Program					contains		
Course							taken by
Lecturer					taught		
Student				Enrolled	enrolled		

Step 3 - Draw rough ERD

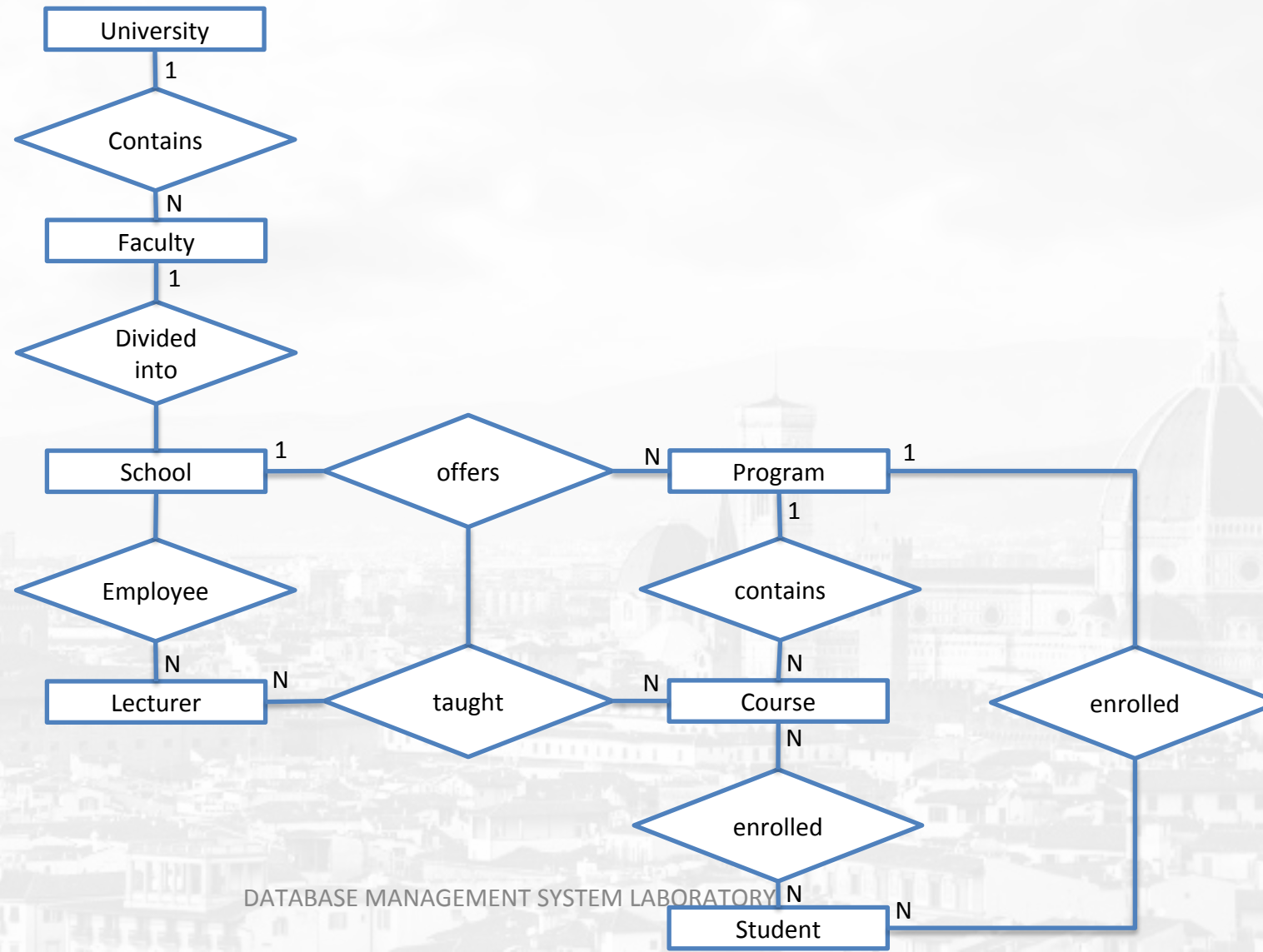
Step 4



Step 4 - Cardinality Identification

- The university contains many faculties
- Each faculty is divided into several schools
- Each school offers numerous programs
- Each program contains many courses
- Each school employs many lecturers
- Lecturers can teach many courses
- Lecturers can teach the same course many times
- Courses can be taught by more than one lecturer
- A student is enrolled in only one program
- Students can be enrolled in many courses at the same time
- Courses have many students enrolled

Step 4 - Cardinality Identification

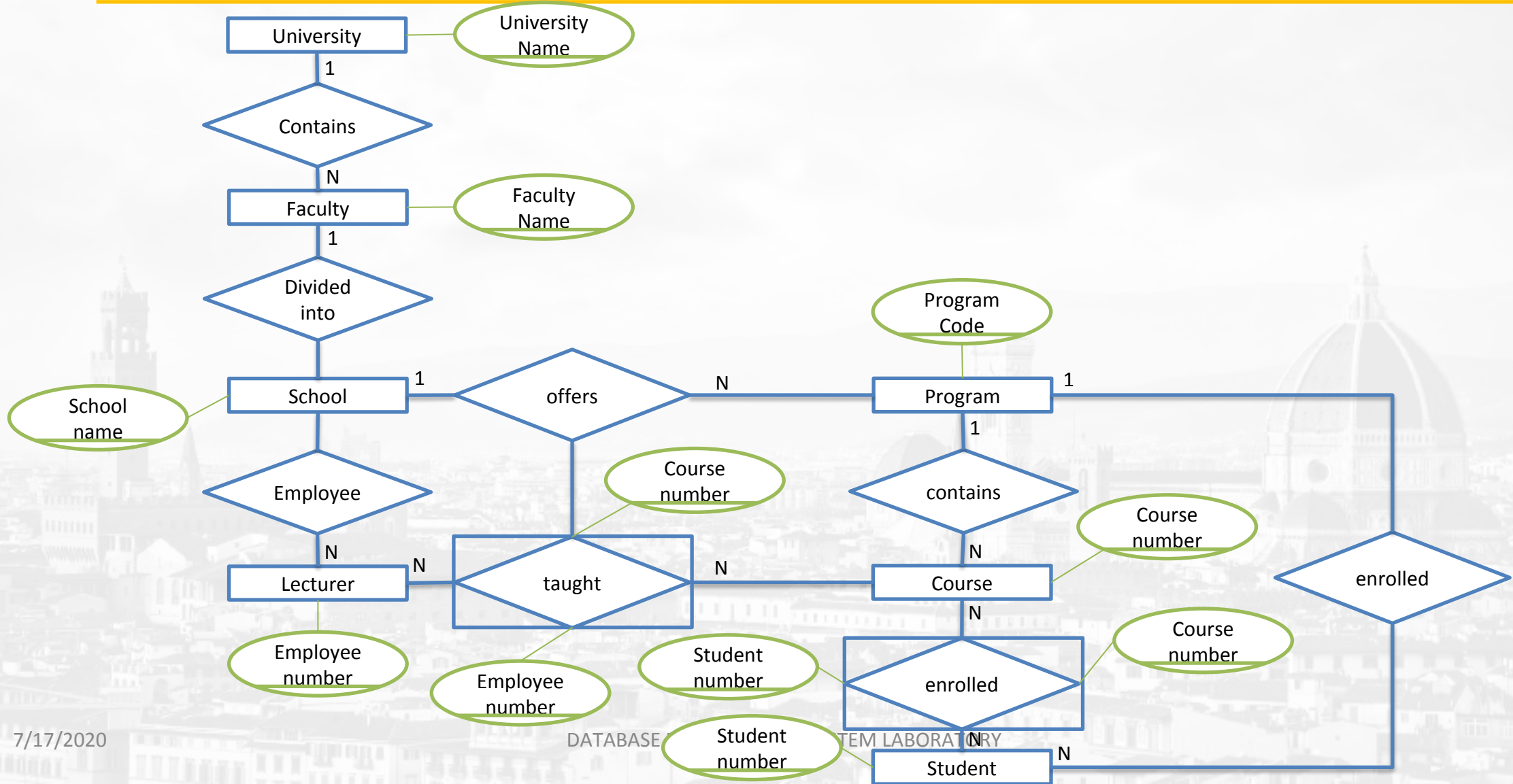


Step 5 - Define primary keys

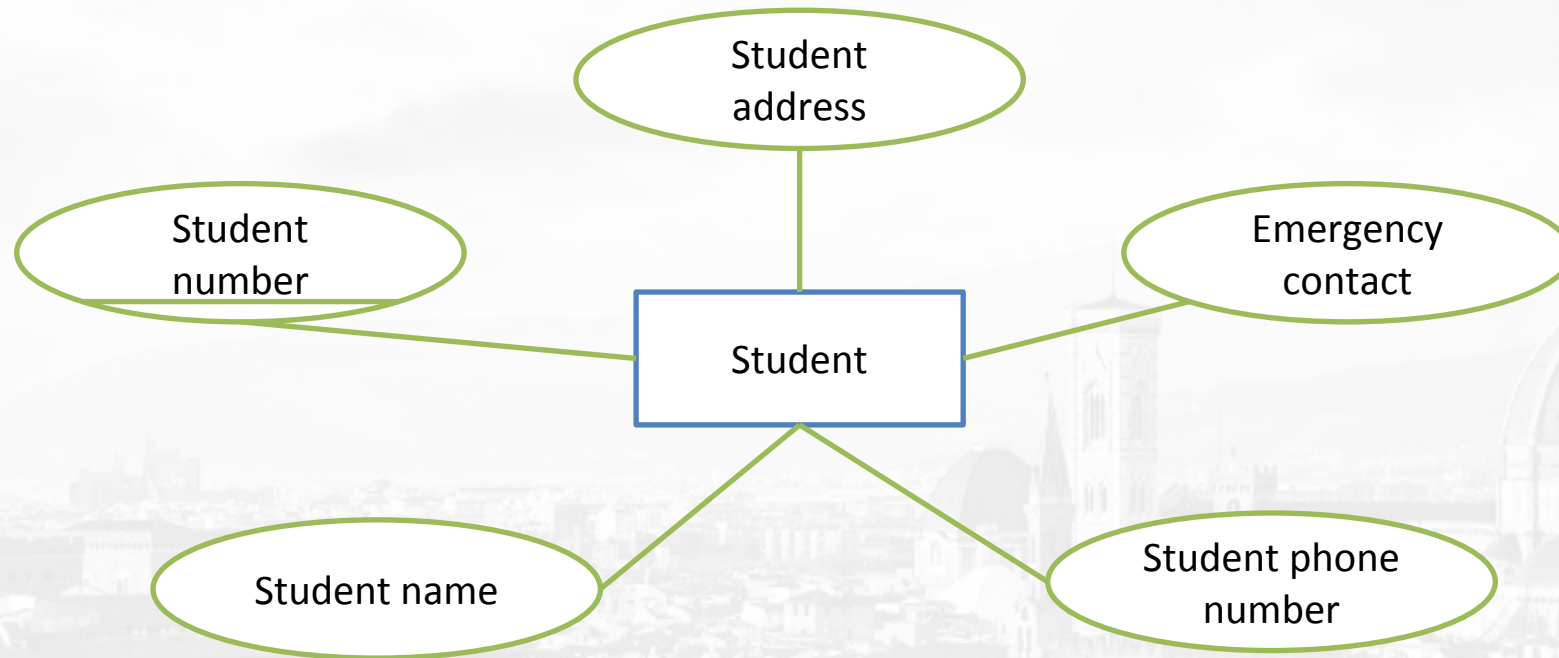
The primary keys could be

- University – University name
- Faculty – Faculty name
- School – School name
- Program – Program code
- Course – Course number
- Lecturer – Employee number
- Student – Student number

Step 6-Draw key-based and Attribute based ERD



Draw fully attributes ERD





BATCH-A EXERCISES

Construct a clean and concise ER diagram for the NHL database.

Suppose you are given the following requirements for a simple database for the National Hockey League (NHL):

- the NHL has many teams,
- each team has a name, a city, a coach, a captain, and a set of players,
- each player belongs to only one team,
- each player has a name, a position (such as left wing or goalie), a skill level, and a set of injury records,
- a team captain is also a player,
- a game is played between two teams (referred to as `host_team` and `guest_team`) and has a date (such as May 11th, 1999) and a score (such as 4 to 2).

Construct a clean and concise ER diagram for the NHL database.

Construct an E/R Schema for Educational Institute

1. In an educational institute, there are several departments and students belong to one of them . Each department has a unique department number, a name, a location, phone number and is headed by a professor.
2. Professors have a unique employee Id, name, phone number. We like to keep track of the following details regarding students: name, unique roll number, sex, phone number, date of birth, age and one or more email addresses.
3. Students have a local address consisting of the hostel name and the room number. They also have home address consisting of house number, street, city and PIN. It is assumed that all students reside in the hostels.
4. A course taught in a semester of the year is called a section. There can be several sections of the same course in a semester; these are identified by the section number. Each section is taught by a different professor and has its own timings and a room to meet.
5. Students enroll for several sections in a semester. Each course has a name, number of credits and the department that offers it. A course may have other courses as prerequisites i.e, courses to be completed before it can be enrolled in.
6. Professors also undertake research projects. These are sponsored by funding agencies and have a specific start ate, end date and amount of money given. More than one professor can be involved in a project. Also a professor may be simultaneously working on several projects. A project has a unique projectId.



BATCH-B EXERCISES

Construct an ER Diagram for Banking System

- The bank is organised into branches. Each branch is located in a particular city and is identified by a unique name. The bank monitors the assets of each branch.
- Bank customers are identified by their customer_id value. The bank stores each customer's name, and the street and the city where the customer lives. Customers may have accounts and can take out loans. A customer may be associated with a particular banker; who may act as a loan officer or personal banker for that customer.
- The bank offers two types of accounts: savings and checking accounts. Accounts can be held by more than one customer, and a customer can have more than one account. Each account is assigned a unique account number. The bank maintains a record of each account's balance and the most recent date on which the account was accessed by each customer holding the account. In addition each savings account has an interest rate, and overdrafts are recorded for each checking account.

Continue..

- The bank provides its customers with loans. A loan originates at a particular branch and can be held by one or more customers. A loan is identified by unique loan number. For each loan, the bank keeps track of loan amount and the loan payments. Although a loan-payment number does not uniquely identify a particular payment among those for all the bank's loans, a payment number does identify a particular payment for a specific loan. The date and the amount are recorded for each payment.
- Bank employees are identified by their employee_id values. The bank administration stores the name and telephone number of each employee, the names of the employee's dependents, and the employee_id number of the employee's manager. The bank also keeps track of the employee's start date and, thus, length of employment.



BATCH-C EXERCISES

COMPANY Database

Requirements of the Company

The company is organized into

- DEPARTMENTS. Each department has a name, number and an employee who manages the department. We keep track of the start date of the department manager.
- Each department controls a number of PROJECTs. Each project has a name, number and is located at a single location.
- We store each EMPLOYEE's social security number, address, salary, sex, and birthdate. Each employee *works for* one department but may *work on* several projects. We keep track of the number of hours per week that an employee currently works on each project. We also keep track of the *direct supervisor* of each employee.
- Each employee may *have* a number of DEPENDENTS. For each dependent, we keep track of their name, sex, birthdate, and relationship to employee.

Construct an E-R diagram for a car-insurance

- Construct an E-R diagram for a car-insurance company whose customers own one or more cars each. Each car has associated with it zero or any number of recorded accidents.



BATCH-D EXERCISES

Construct an ER Diagram for the registrar's office

A university registrar's office maintains data about the following entities:

- (a) Courses, including course number, title , credits, syllabus, and prerequisites;
- (b) Course offerings, including course number, year, semester, section number, instructor's, timings, and classroom;
- (c) Students, including student-id, name, and program; and
- (d) Instructors, including identification number, name, department, and title. Further, the enrollment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled.

Construct an E-R diagram for the registrar's office. Document all assumptions that you make about the mapping constraints.

Construct an E-R diagram for a hospital

- Construct an E-R diagram for a hospital with a set of patients and set of medical doctors . Associate with each patient a log of the various tests and examinations conducted.

Thank You!