COMP 3311
DATABASE MANAGEMENT SYSTEMS

LECTURE 2 EXERCISES
ENTITY-RELATIONSHIP (E-R) MODEL AND DATA BASE DESIGN

EXERCISE 1: UNIVERSITY APPLICATION

We want to record information about students, departments, courses and course teaching teams.

- For each student we store the student id, name and majors.
- For each department we store a unique code and name.
- For each course we store a unique course id, name, department and prerequisites.
- For each offering of a course we store the section, semester and year.
- Each student must enroll in one to five course offerings.
- Each course offering can enroll zero to sixty students.
- For each course offering that a student takes we store the grade.
- Each course offering's teaching team has one or more staff, who is either an instructor or a TA.
- For each staff assigned to a course offering's teaching team we store the hkid, name, department and office number.
- For each instructor we store their academic title (e.g., professor).

Construct an E-R diagram for the university application.

EXERCISE 1: UNIVERSITY APPLICATION— ENTITY TYPES

- For each student we store the student id, name and majors.
- For each department we store a unique code and name.
- For each course we store a unique course id, name, department and prerequisites.
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- For each instructor we store their academic title (e.g., professor).

Student | Department | Course | Offering | Staff | Instructor | TA

EXERCISE 1: UNIVERSITY APPLICATION— ATTRIBUTES OF ENTITY TYPES

- For each student we store the student id, name and majors.
- For each department we store a unique code and name.
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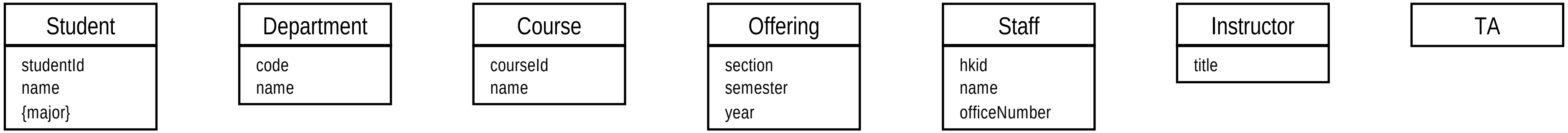

Student
studentId
name
{major}

Department
code
name

Course
courseId
name

Offering
section
semester
year

Staff
hkid
name
officeNumber

Instructor
title

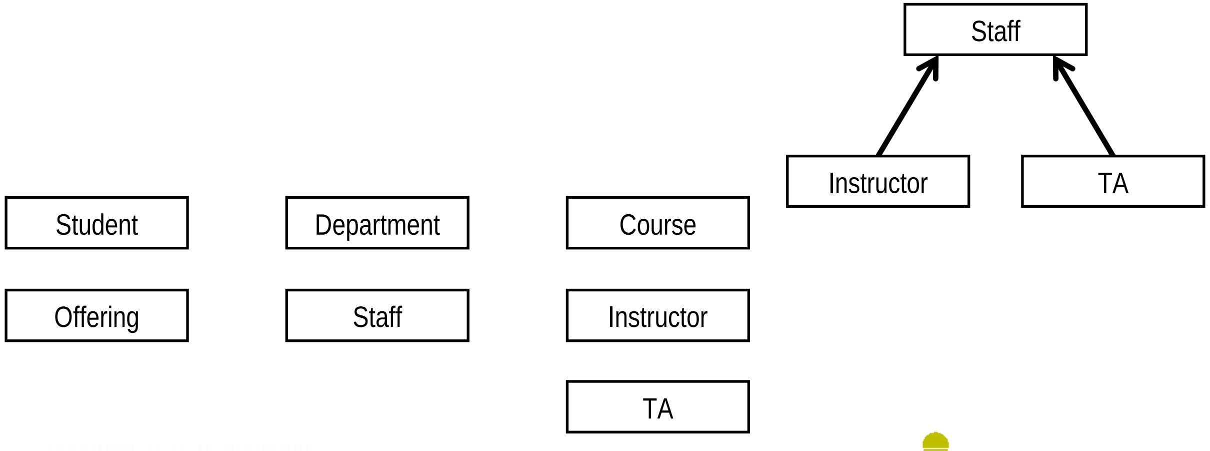
TA

EXERCISE 1: UNIVERSITY APPLICATION— GENERALIZATION

- Each course offering's teaching team has one or more staff, who is either an instructor or a TA.

What should be the generalization?

⟹ Staff superclass; Instructor, TA subclasses.

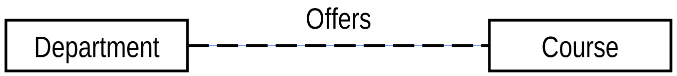


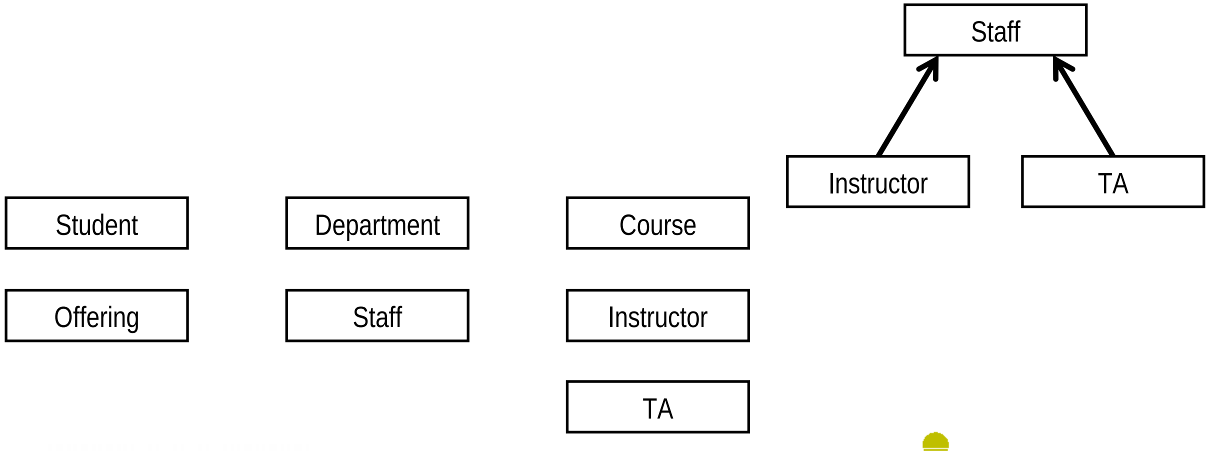
EXERCISE 1: UNIVERSITY APPLICATION— RELATIONSHIP TYPES

- For each course we store a unique course id, name, department and prerequisites.

What should be related?

⟹ Course related to Department.



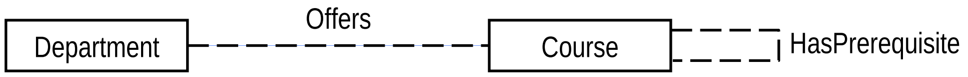


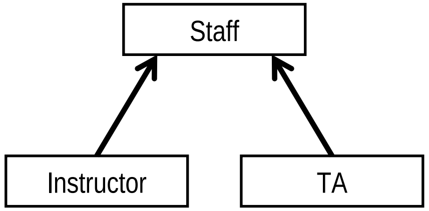
EXERCISE 1: UNIVERSITY APPLICATION— RELATIONSHIP TYPES

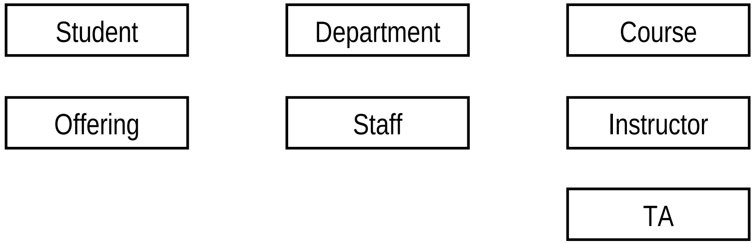
- For each course we store a unique course id, name, department and prerequisites.

What should be related?

⟹ Course related to Course (unary relationship).





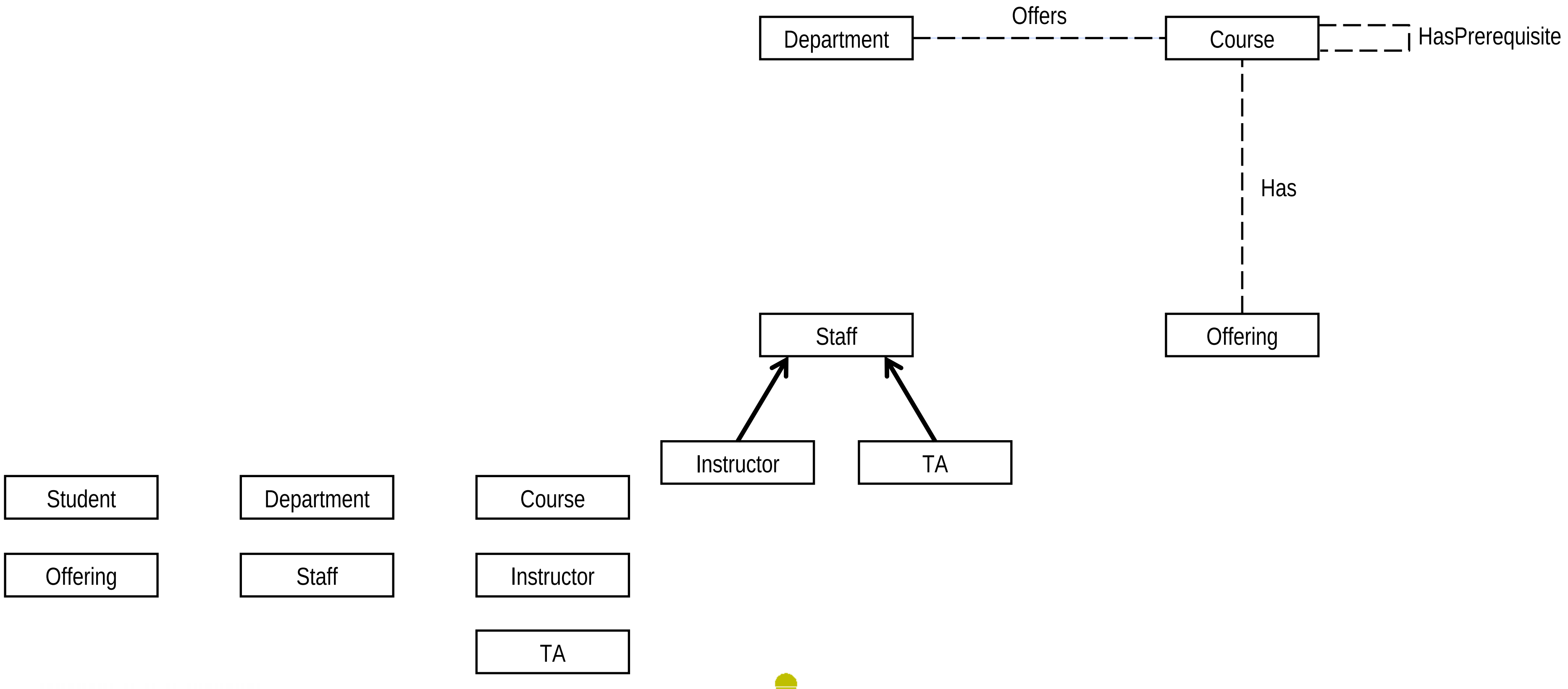


EXERCISE 1: UNIVERSITY APPLICATION— RELATIONSHIP TYPES

- For each offering of a course we store the section, semester and year.

What should be related?

⟹ Offering related to Course.

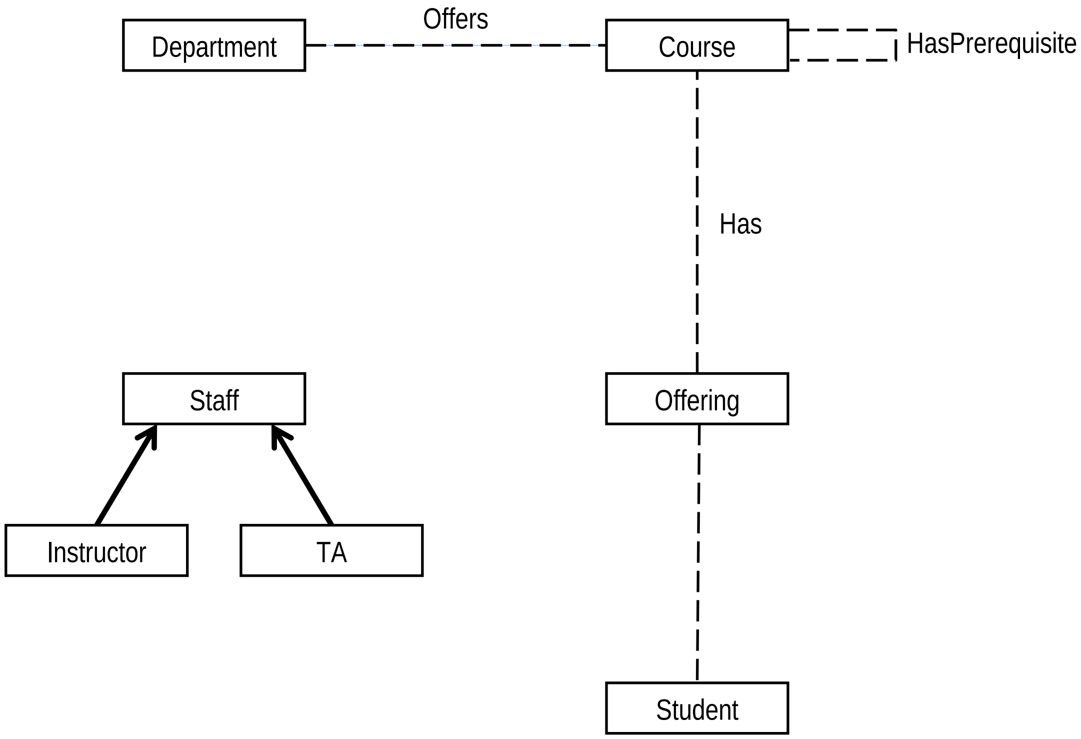


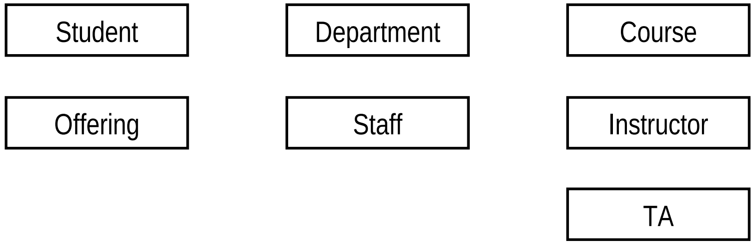
EXERCISE 1: UNIVERSITY APPLICATION— RELATIONSHIP TYPES

- Each student must enroll in one to five course offerings.
- Each course offering can enroll zero to sixty students.
- For each course that a student takes we store the grade.

What should be related?

⟹ Student related to Offering.



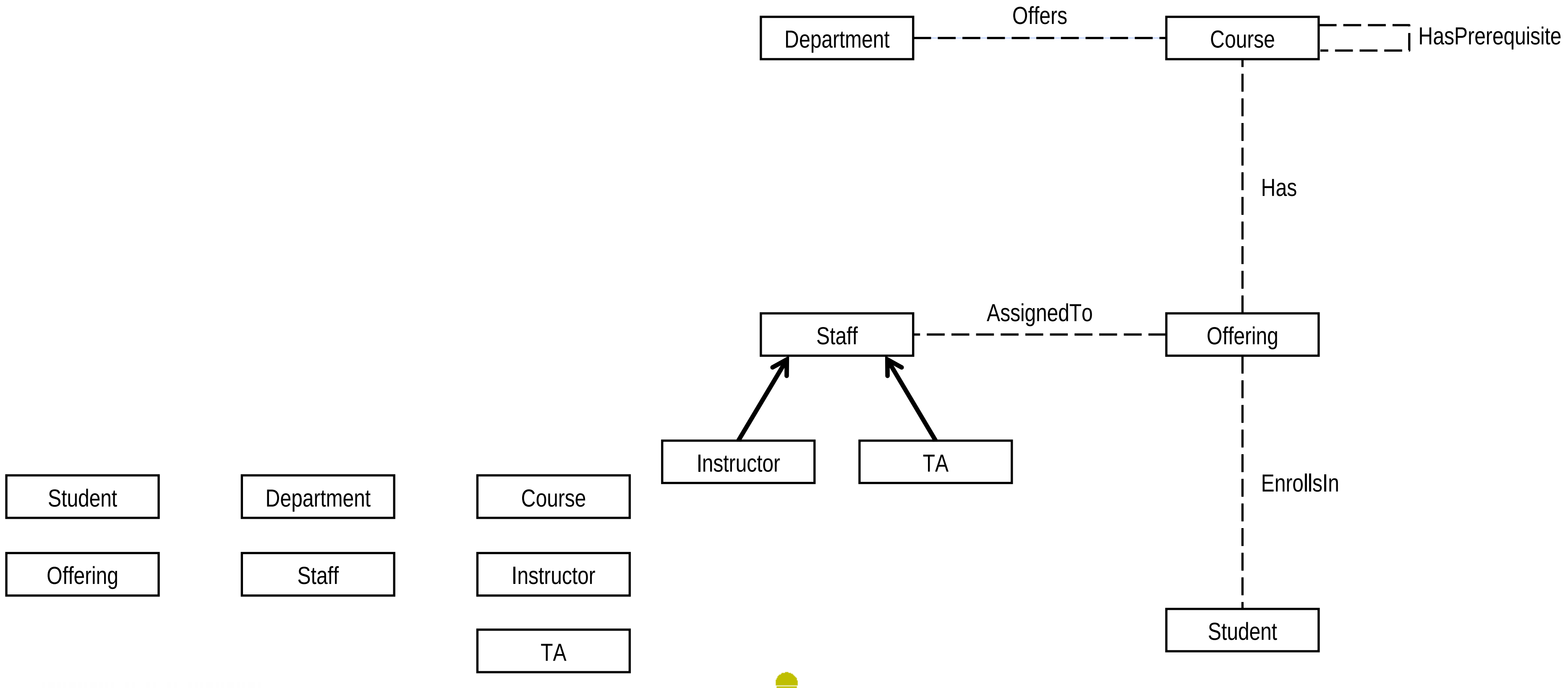


EXERCISE 1: UNIVERSITY APPLICATION— RELATIONSHIP TYPES

- For each staff assigned to a course offering's teaching team we store the hkid, name, department and office number.

What should be related?

⟹ Staff related to Offering.

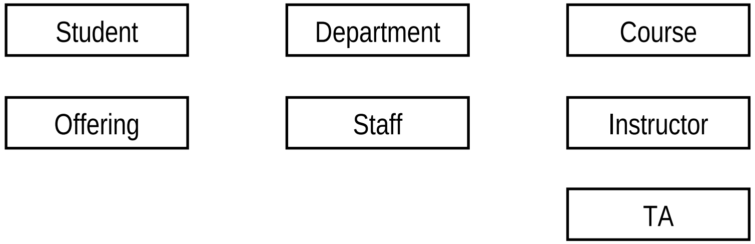


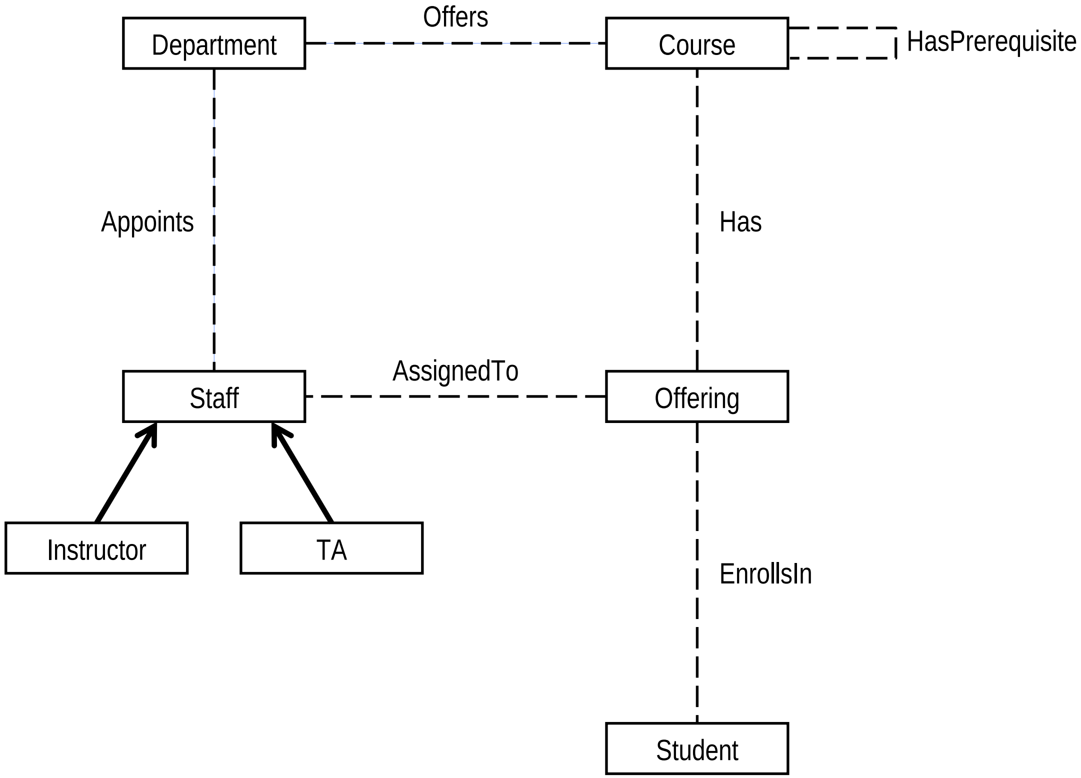
EXERCISE 1: UNIVERSITY APPLICATION— RELATIONSHIP TYPES

- For each staff assigned to a course offering's teaching team we store the hkid, name, department and office number.

What should be related?

⟹ Staff related to Department.





EXERCISE 1: UNIVERSITY APPLICATION— RELATIONSHIP ATTRIBUTES

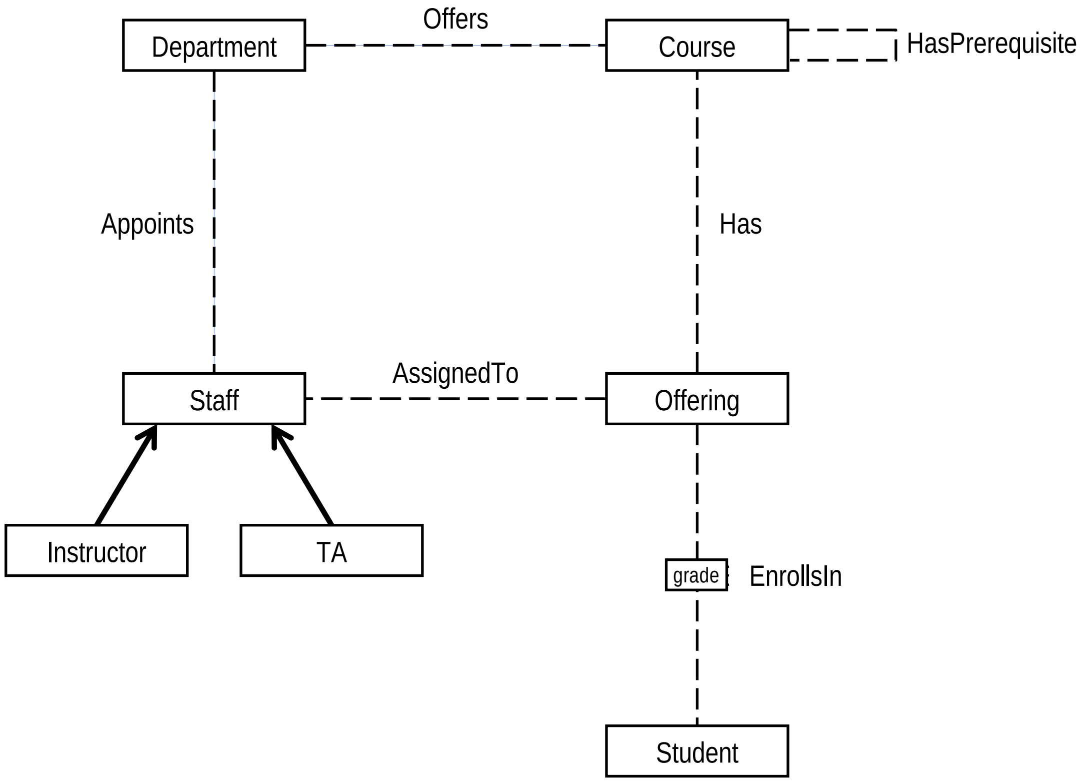
- Each student must enroll in one to five course offerings.
- Each course offering can enroll zero to sixty students.
- For each course that a student takes we store the grade.

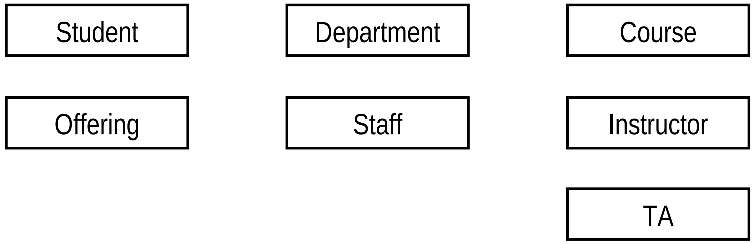
Any relationship attributes?

⟹ Yes — grade attribute

Add where?

⟹ To EnrollsIn relationship.



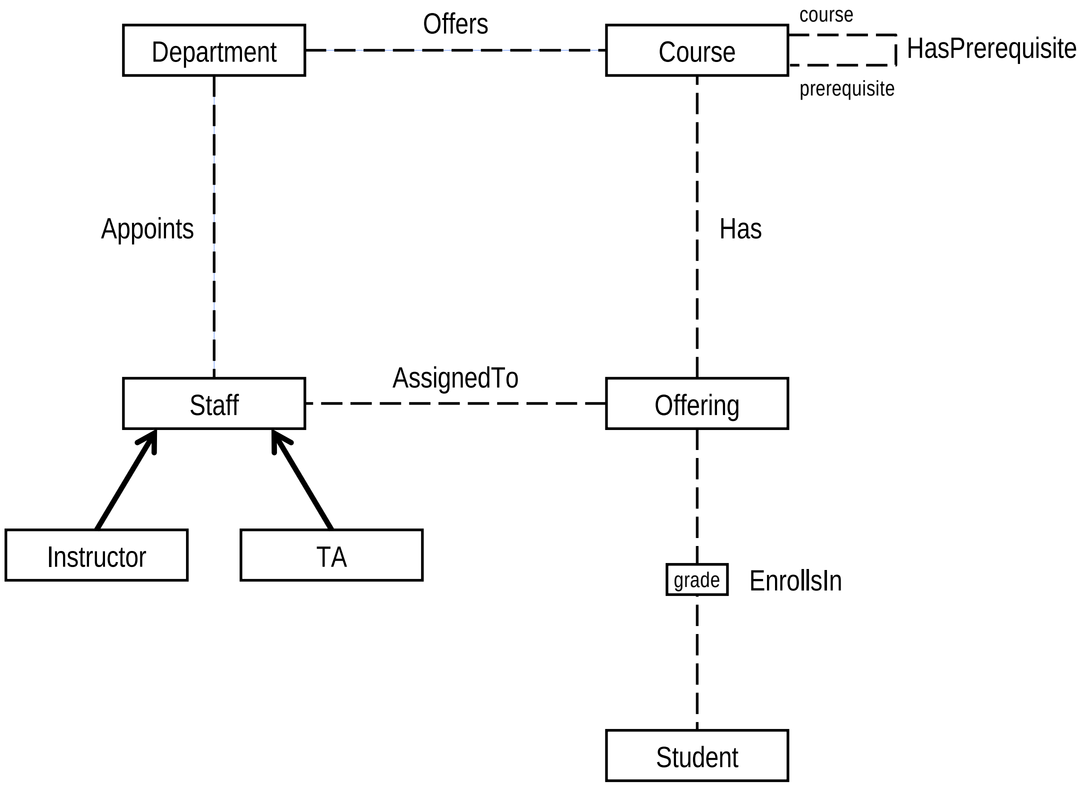


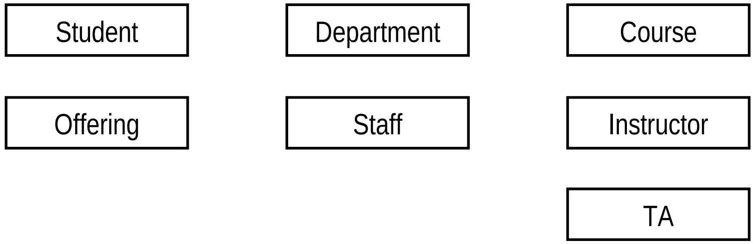
EXERCISE 1: UNIVERSITY APPLICATION— RELATIONSHIP ROLE NAMES

- For each course we store a unique course id, name, department and prerequisites.

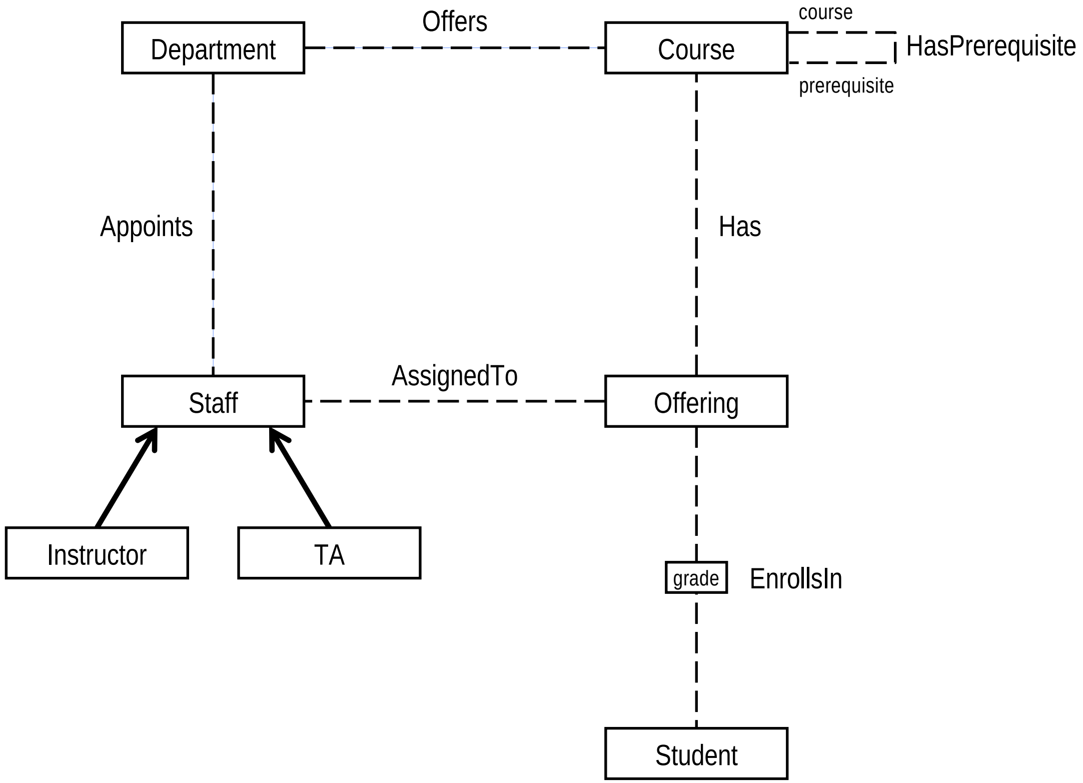
Any role names?

⟹ Yes — add role names to Prerequisite.





EXERCISE 1: UNIVERSITY APPLICATION— E-R DIAGRAM



Student	Department	Course	Offering	Staff	Instructor	TA
studentId	code	courseId	section	hkid	title	
name	name	name	semester	name		
{major}			year	officeNumber		

EXERCISE 2: BUS COMPANY APPLICATION

We want to keep track of bus routes and schedules for a bus company.

- Each bus route has a unique route number, a departure station and a destination station.
- For each bus route, there is a schedule, which records the departure times of buses.
- For each departure time of each route, a driver and a bus can be assigned; however, information about the driver or the bus may sometimes be missing.
- A driver has a unique employee id, a name and a phone number.
- A bus is identified by its license number and has a maximum seating capacity.

Construct an E-R diagram for the bus company application.

EXERCISE 2: BUS COMPANY APPLICATION— ENTITY TYPES

We want to keep track of bus routes and schedules for a bus company.

- Each bus route has a unique route number, a departure station and a destination station.
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- A driver has a unique employee id, a name and a phone number.
- A bus is identified by its license number and has a maximum seating capacity.

Route
Schedule
Driver
Bus

EXERCISE 2: BUS COMPANY APPLICATION— ATTRIBUTES OF ENTITY TYPES

- Each bus route has a unique route number, a departure station and a destination station.
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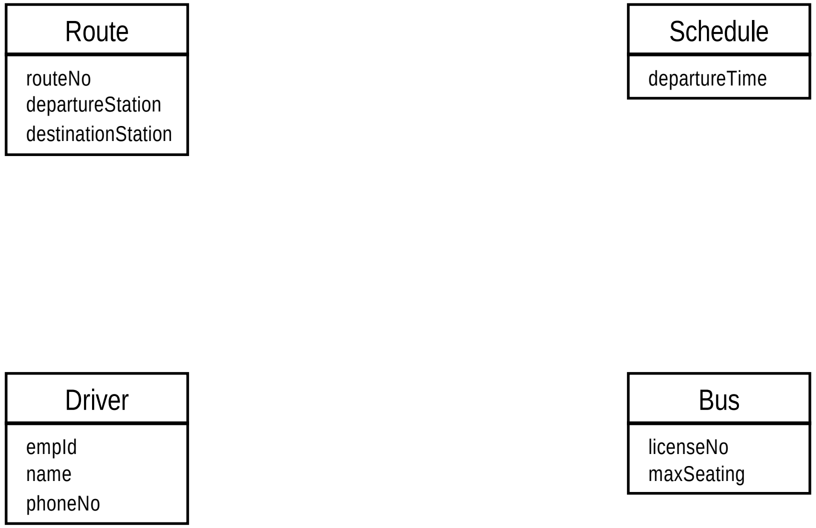


Route
routeNo
departureStation
destinationStation

Schedule
departureTime

Driver
empId
name
phoneNo

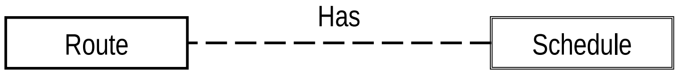
Bus
licenseNo
maxSeating

EXERCISE 2: BUS COMPANY APPLICATION— RELATIONSHIP TYPES (ROUTE, SCHEDULE)

- Each bus route has a unique route number, a departure station and a destination station.
- For each bus route, there is a schedule, which records the departure times of buses.

What should be related?

⟹ Route related to Schedule.



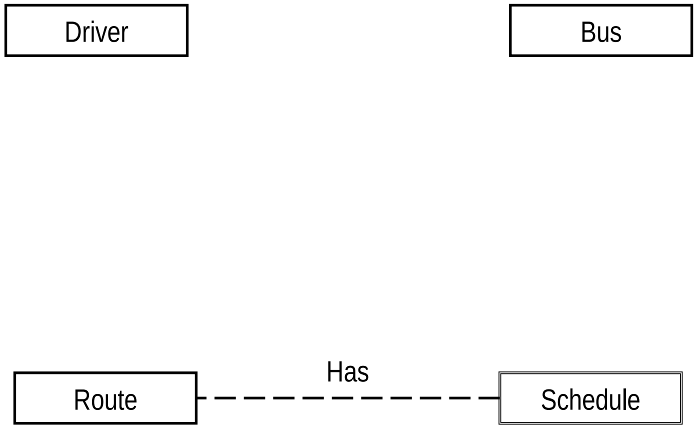
EXERCISE 2: BUS COMPANY APPLICATION— RELATIONSHIP TYPES (DRIVER, BUS)

- For each departure time of each route, a driver and a bus can be assigned; however, information about the driver or the bus may sometimes be missing.

What should be related?

⟹ Driver related to Bus.

How should they be related?



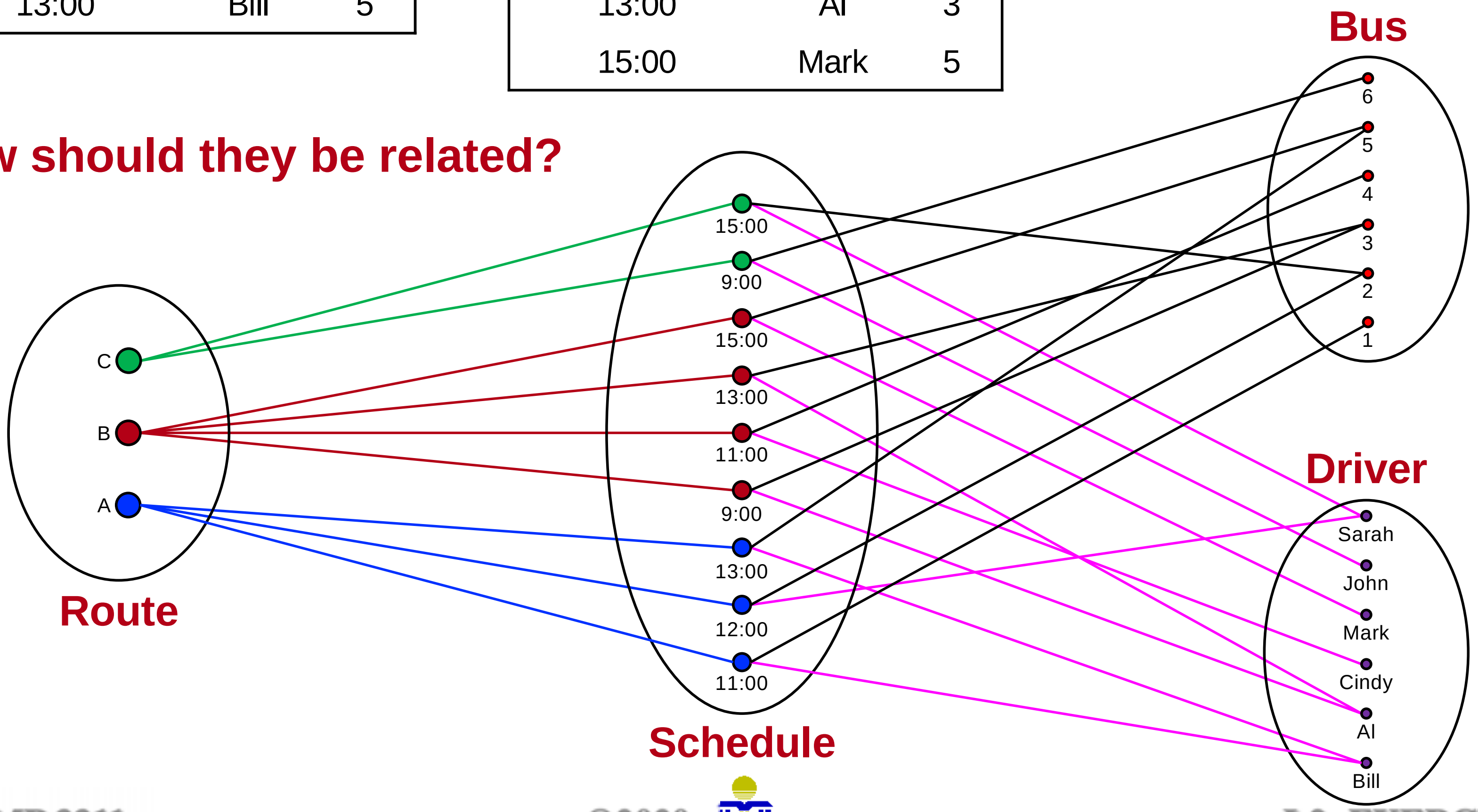
EXERCISE 2: WHAT IS A SCHEDULE?

Route A		
Departure time	Driver	Bus
11:00	Bill	1
12:00	Sarah	2
13:00	Bill	5

Route B		
Departure time	Driver	Bus
9:00	Al	3
11:00	Cindy	4
13:00	Al	3
15:00	Mark	5

Route C		
Departure time	Driver	Bus
9:00	John	6
15:00	Sarah	2

How should they be related?



EXERCISE 2: BUS COMPANY APPLICATION— RELATIONSHIP TYPES (DRIVER, BUS)

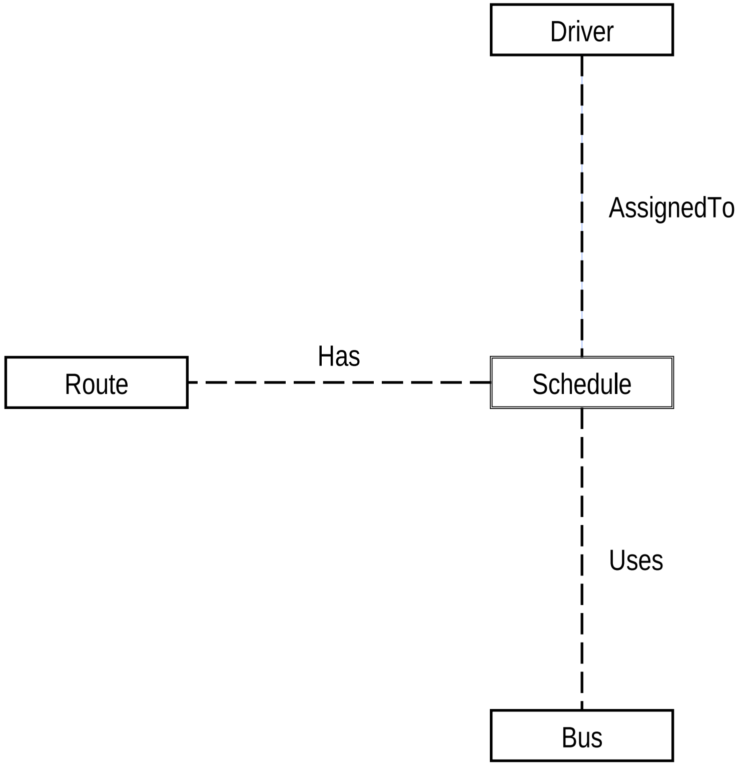
- For each departure time of each route, a driver and a bus can be assigned; however, information about the driver or the bus may sometimes be missing.

What should be related?

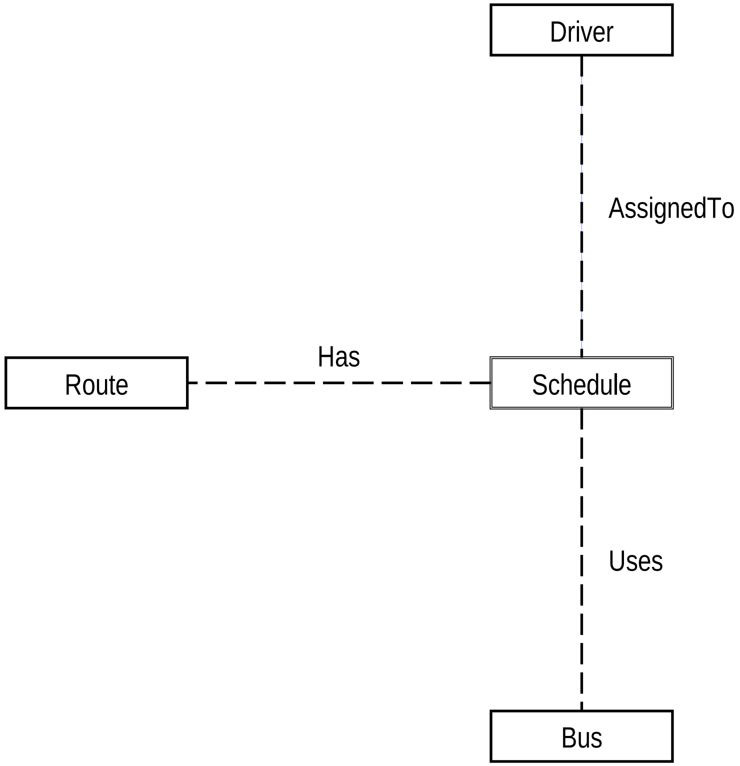
⟹ Driver related to Bus.

How should they be related?

⟹ Through the Schedule entity.



EXERCISE 2: BUS COMPANY APPLICATION— E-R DIAGRAM



Driver

AssignedTo

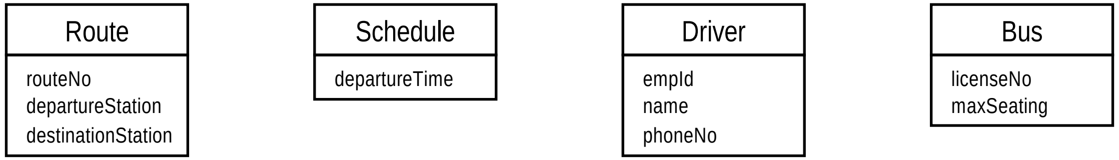
Route

Has

Schedule

Uses

Bus



Route

routeNo
departureStation
destinationStation

Schedule

departureTime

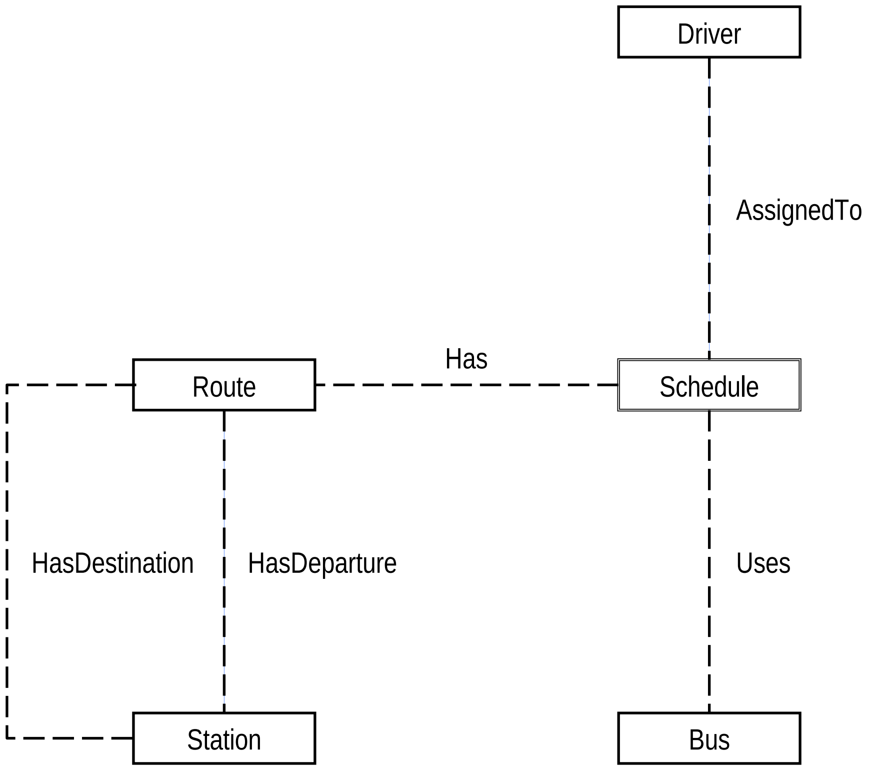
Driver

empId
name
phoneNo

Bus

licenseNo
maxSeating

EXERCISE 2: BUS COMPANY APPLICATION— E-R DIAGRAM POSSIBLE REFINEMENT



Driver

AssignedTo

Route

Has

Schedule

HasDestination

HasDeparture

Uses

Station

Bus

Route
routeNo

Schedule
departureTime

Driver
empId
name
phoneNo

Bus
licenseNo
maxSeating

Station
name