**Information Systems Department Faculty of Computers and Information**

**Assiut University Course Name: Databases**

**2nd Year, Spring 2021**

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**Sheet 1: Entity-Relationship Diagram**

**Answer the following problems:**

1. A lecturer, identified by his or her number, name and room number, is responsible for organizing a number of course modules. Each module has a unique code and also a name and each module can involve a number of lecturers who deliver part of it. A module is composed of a series of lectures and because of economic constraints and common sense, sometimes lectures on a given topic can be part of more than one module. A lecture has a time, room and date and is delivered by a lecturer and a lecturer may deliver more than one lecture. Students, identified by number and name, can attend lectures and a student must be registered for a number of modules. We also store the date on which the student first registered for that module. Finally, a lecturer acts as a tutor for a number of students and each student has only one tutor.

Design and draw an ER diagram that captures the information about this university.

**2. Draw an ER diagram for each of the following situations. On the diagram be sure to identify the cardinality, existence, and optionality of each relationship.**

A. A company has a number of employees. Each employee may be assigned to one or more projects, or may not be assigned to a project. A project must have at least one employee assigned, and may have several employees assigned.

B. A university has a large number of courses in its catalog. Each course may have one or more other courses as pre-requisites, or may have no prerequisites.

C. A college course may have one or more scheduled sections, or may not have a scheduled section.

D. A hospital patient has a patient history. Each patient has one or more history records (we assume that the initial patient visit is always recorded as an instance of the history). Each patient history record belongs to exactly one patient.

1. **Consider the following information about a university database:**

* Professors have an SSN, a name, an age, a rank, and a research specialty.
* Projects have a project number, a sponsor name (e.g., NSF), a starting date, an ending date, and a budget.
* Graduate students have an SSN, a name, an age, and a degree program (e.g., M.S. or Ph.D.).
* Each project is managed by one professor (known as the project's principal investigator).
* Each project is worked on by one or more professors (known as the project's co-investigators).
* Professors can manage and/or work on multiple projects.
* Each project is worked on by one or more graduate students (known as the project's research assistants).
* When graduate students work on a project, a professor must supervise their work on the project.
* Graduate students can work on multiple projects, in which case they will have a (potentially different) supervisor for each one.
* Departments have a department number, a department name, and a main once.
* Departments have a professor (known as the chairman) who runs the department.
* Professors work in one or more departments, and for each department that they work in, a time percentage is associated with their job.
* Graduate students have one major department in which they are working on their degree.
* Each graduate student has another, more senior graduate student (known as a student advisor) who advises him or her on what courses to take.

Design and draw an ER diagram that captures the information about the university.

1. A Bus Company owns a number of busses. Each bus is allocated to a particular route, although some routes may have several busses. Each route passes through a number of towns. One or more drivers are allocated to each stage of a route, which corresponds to a journey through some or all of the towns on a route. Some of the towns have a garage where busses are kept and each of the busses are identified by the registration number and can carry different numbers of passengers, since the vehicles vary in size and can be single or double-decked. Each route is identified by a route number and information is available on the average number of passengers carried per day for each route. Drivers have an employee number, name, address, and sometimes a telephone number.

Design and draw an ER diagram that captures the information about this system.

**5. Consider the following ER diagram:**

Instructor

Course

Text

Teaches

Uses

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. Supply(min,max) constraints on this diagram. State clearly any additional assumptions you make. If we add the relationship ADOPTS between INSTRUCTOR and TEXT what (min,max) constraints would you put on it? Why?