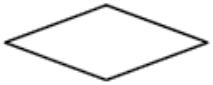
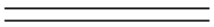
Entity/Relationship Modeling

Continuation

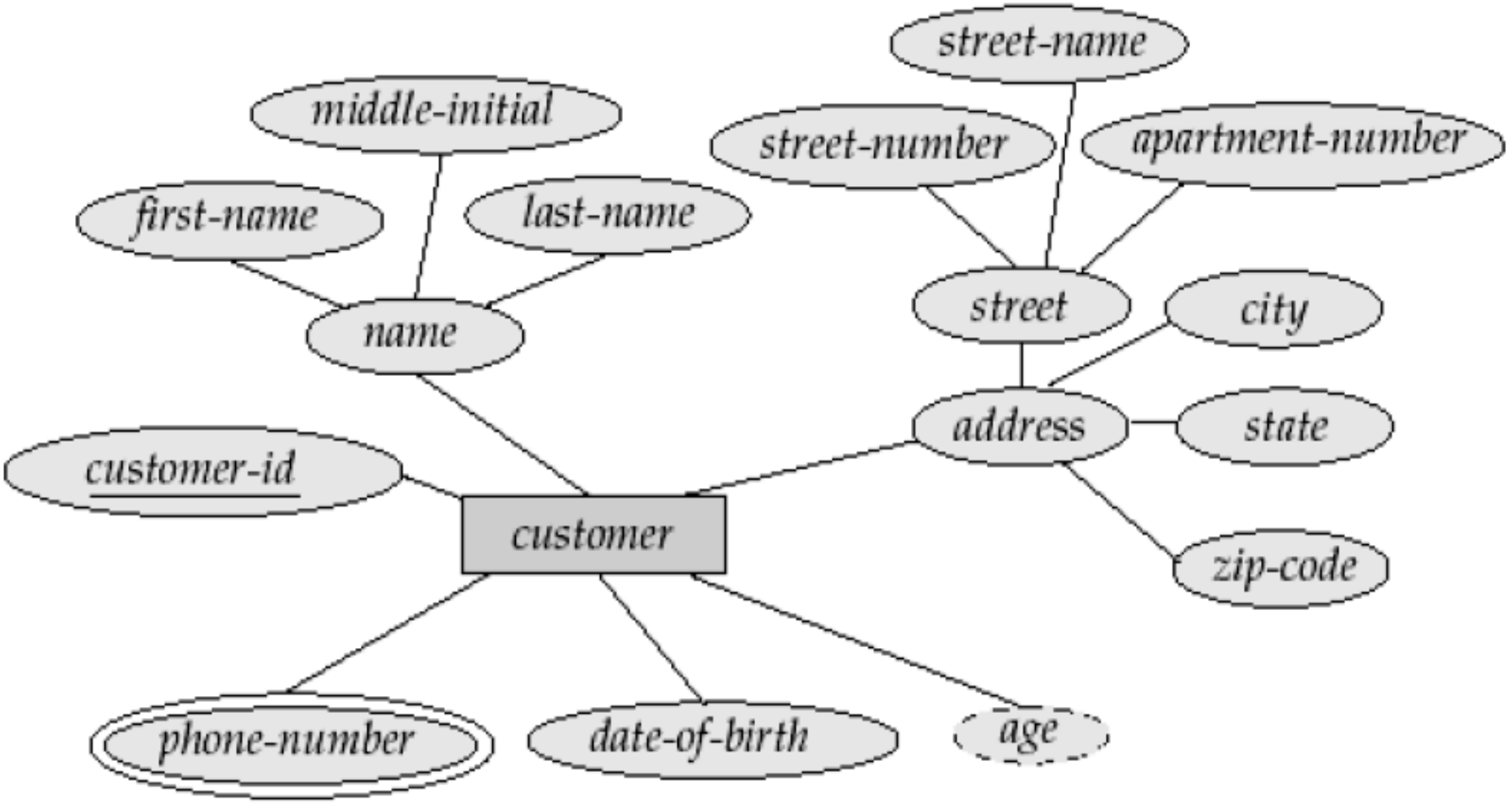
Introduction

* **E-R diagram** can express the overall logical structure of a database graphically.
* **E-R diagram** consists of the following major components

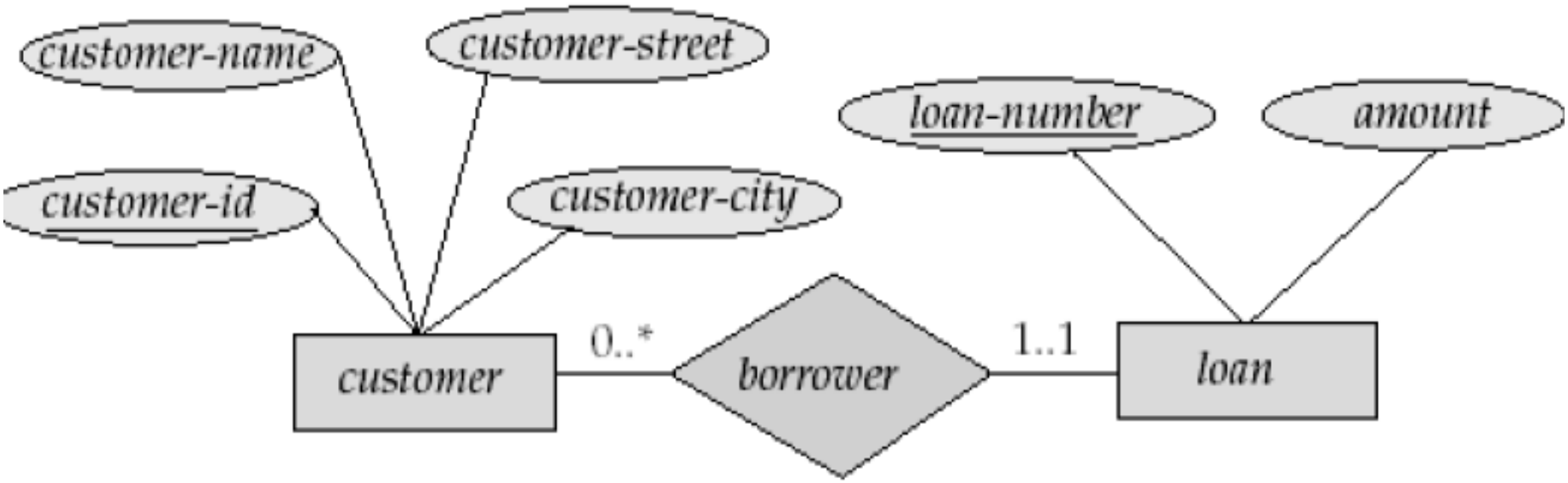
Symbols

Component name	*Symbol*	*Description*
Rectangles		represent entity sets
Ellipses		represent attributes
Diamonds		represent relationship sets
Lines		link attributes to entity sets and entity sets to relationship sets
Double ellipses		represent multivalued attributes
Dashed ellipses		represent derived attributes
Double lines		Represent total participation of an entity in a relationship set

E-R diagram with multivalued, and derived attributes.



Example 2



0..* indicates a customer can have 0 or more loan

1..1 indicates a loan must have one associated customer

Strong and Weak entity sets

* An entity set may not have sufficient attributes to form a primary key. Such an entity set is termed a **weak entity set**
* An entity set that has a primary key is termed a **strong entity set.**

Task 1:Example

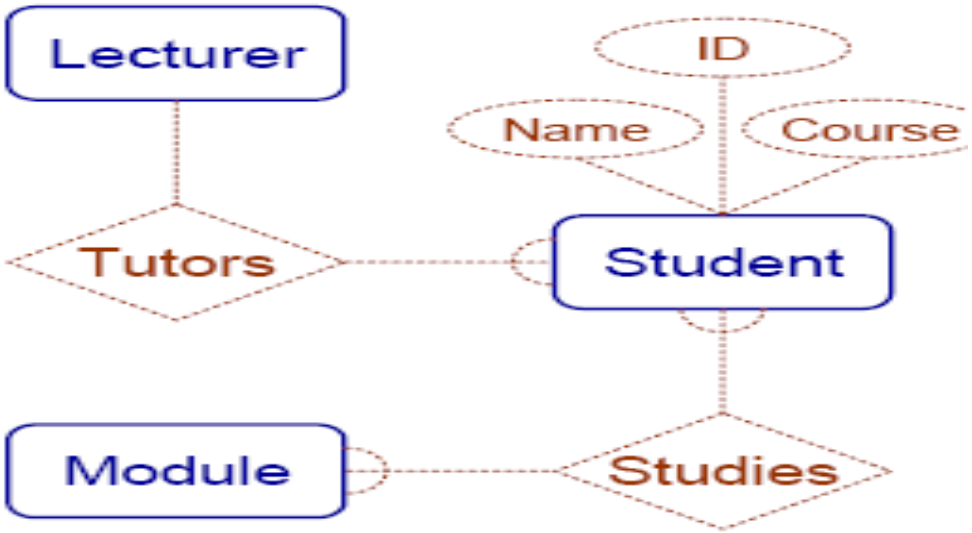
* In a University database we might have entities for Students, Modules and Lecturers. Students might have attributes such as their ID, Name, and Course, and could have relationships with Modules (enrolment) and Lecturers (tutor/tutee)

Entity/Relationship Diagram

* E/R diagrams Can:
  * Give a conceptual view of the database
  * Are independent of the choice of DBMS
  * Can identify some problems in a design

Diagramming Entities

* In an E/R Diagram, an entity is usually drawn as a box with rounded corners
* The box is labeled with the name of the class of objects represented by that entity

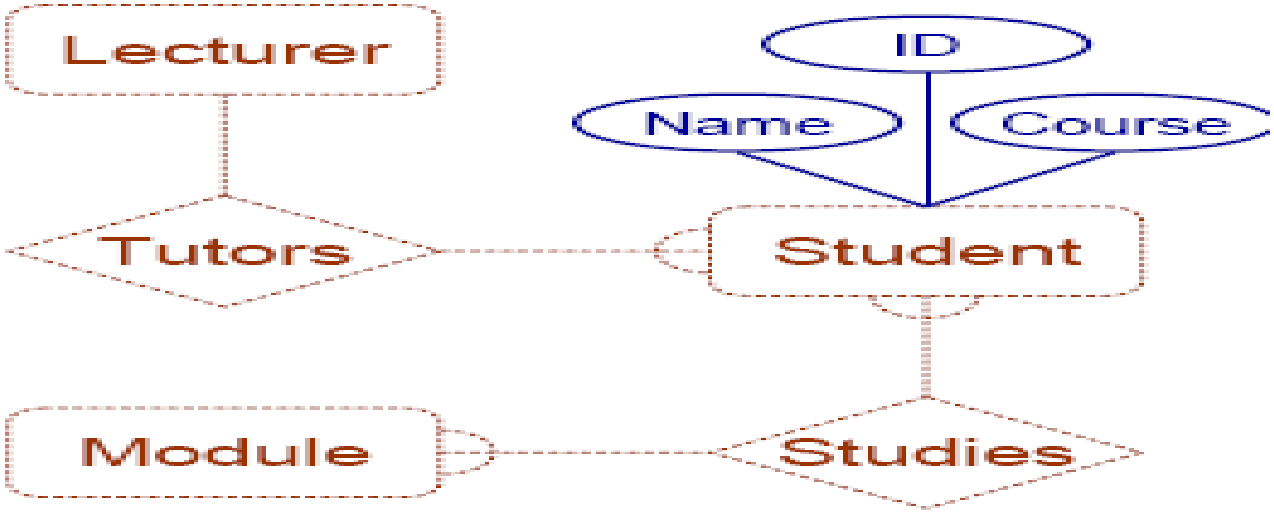


Attributes

* Attributes are facts, aspects, properties, or details about an entity
  * Students have IDs, names, courses, addresses, …
  * Modules have codes, titles, credit weights, levels,

Diagramming Attributes

* In an E/R Diagram attributes may be drawn as ovals
* Each attribute is linked to its entity by a line
* The name of the attribute is written in the oval



Relationships

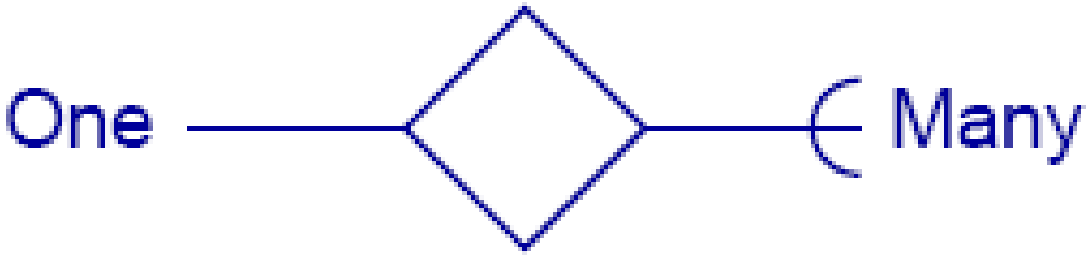
* Relationships are an association between two or more entities
  * Each Student takes several Modules
  * Each Module is taught by a Lecturer
  * Each Employee works for a single Department

Cardinality Ratios

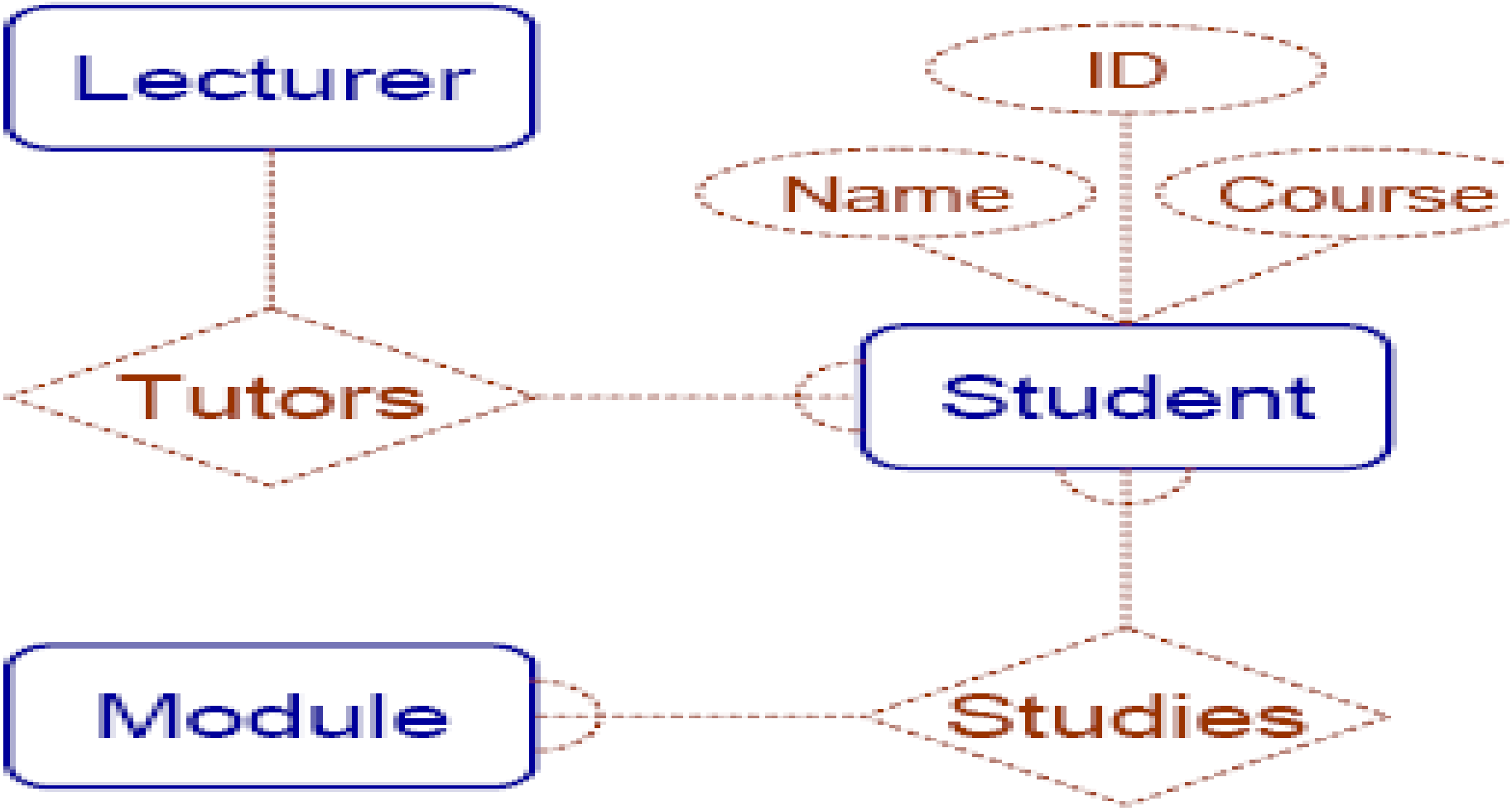
* One to one (1:1)
  * Each lecturer has a unique office
* One to many (1:M)
  * A lecturer may tutor many students, but each student has just one tutor
* Many to many (M:M)
  * Each student takes several modules, and each module is taken by several students

Diagramming Relationships

* Relationships are links between two entities
* The name is given in a diamond box
* The ends of the link show cardinality



Full Example



Making E/R Models

* To make an E/R model you need to identify
  * Enitities
  * Attributes
  * Relationships
  * Cardinality ratios

from a description

Class Example

* A university consists of a number of departments. Each department offers several courses. A number of modules make up each course. Students enrol in a particular course and take modules towards the completion of that course. Each module is taught by a lecturer from the appropriate department, and each lecturer tutors a group of students

Task 1:Identify Entities

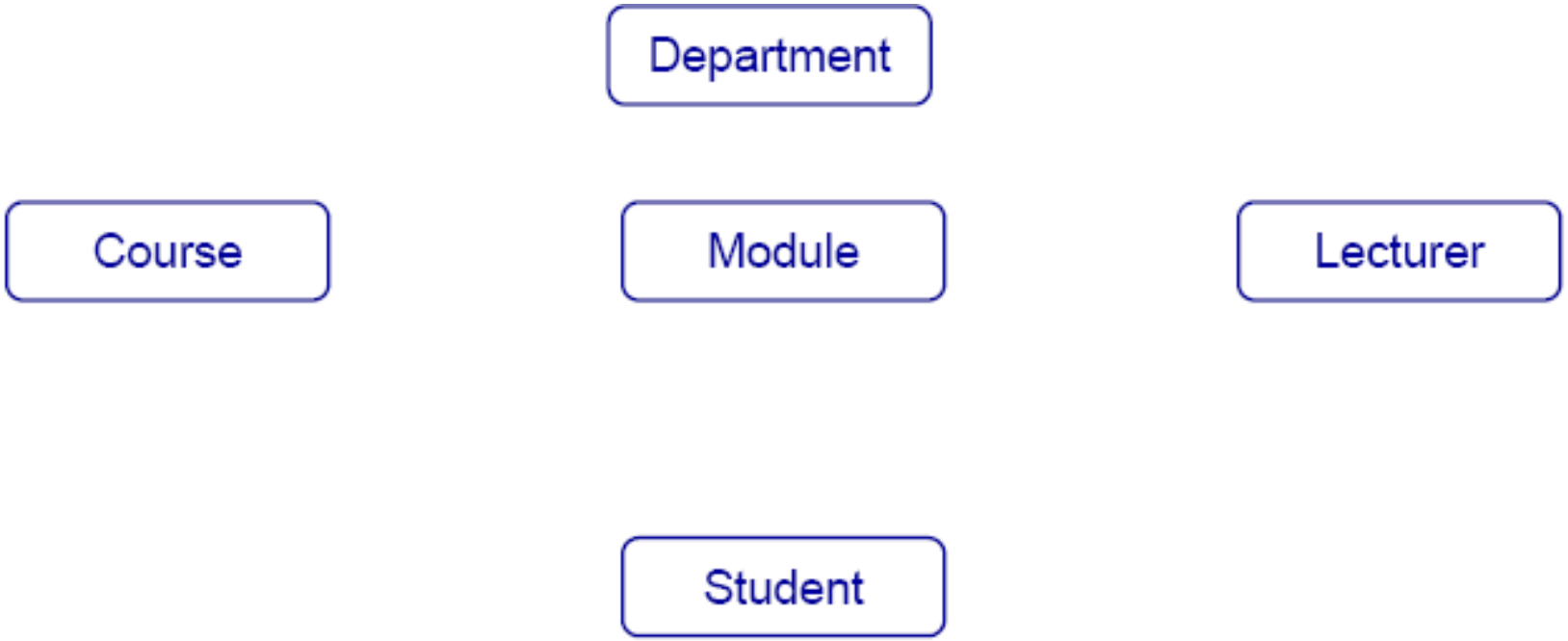
* A university consists of a number of **departments**. Each department offers several **courses**. A number of **modules** make up each course. **Students** enrol in a particular course and take modules towards the completion of that course. Each module is taught by a **lecturer** from the appropriate department, and each lecturer tutors a group of students

Task2-Identify Relationships

* A university consists of a number of departments. Each department **offers** several courses. A number of modules **make up** each course. Students **enrol in** a particular course and **take** modules towards the completion of that course. Each module is **taught by** a lecturer **from the** appropriate department, and each lecturer **tutors** a group of students

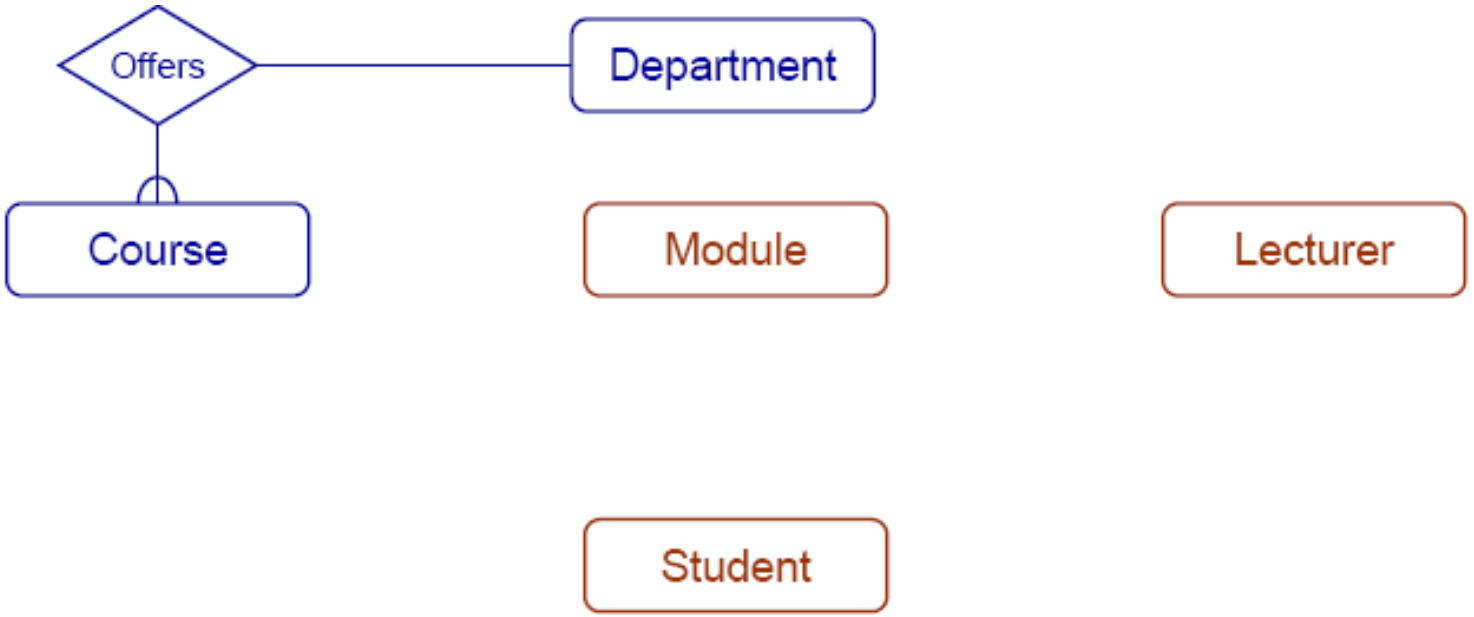
Example - E/R Diagram

* Entities:
  * Department, Course, Module, Lecturer, Student



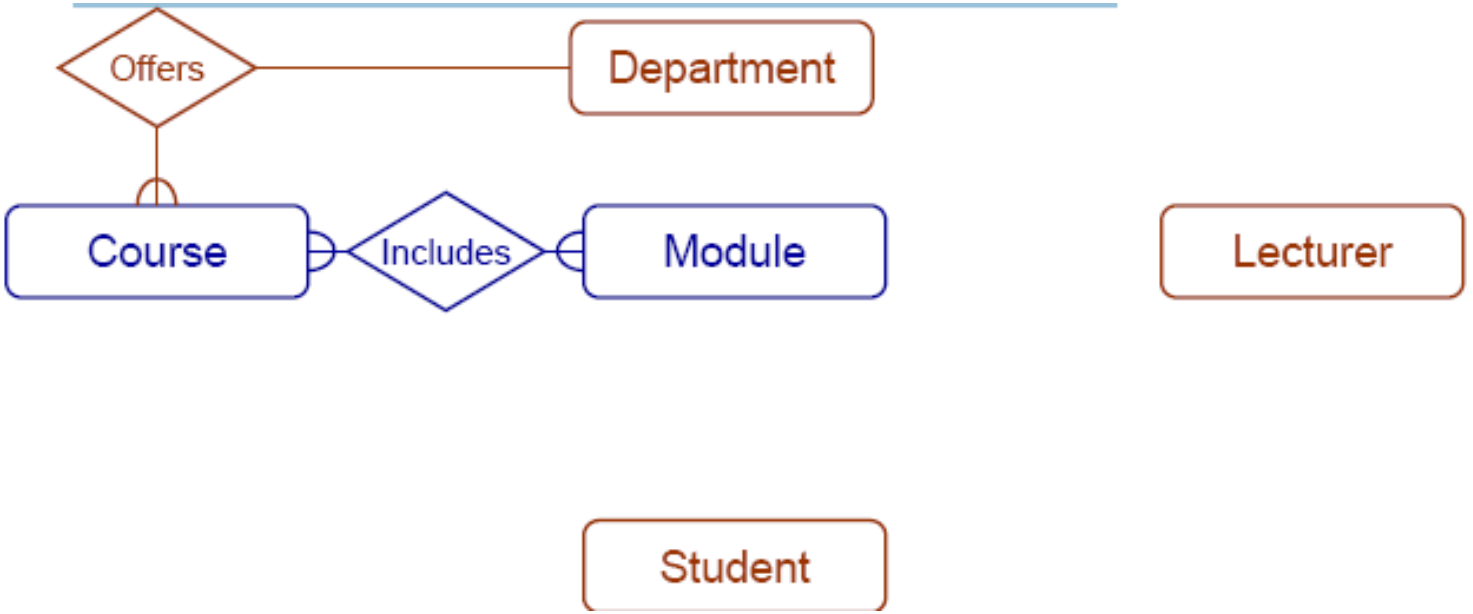
Example - E/R Diagram

* Each department offers several courses



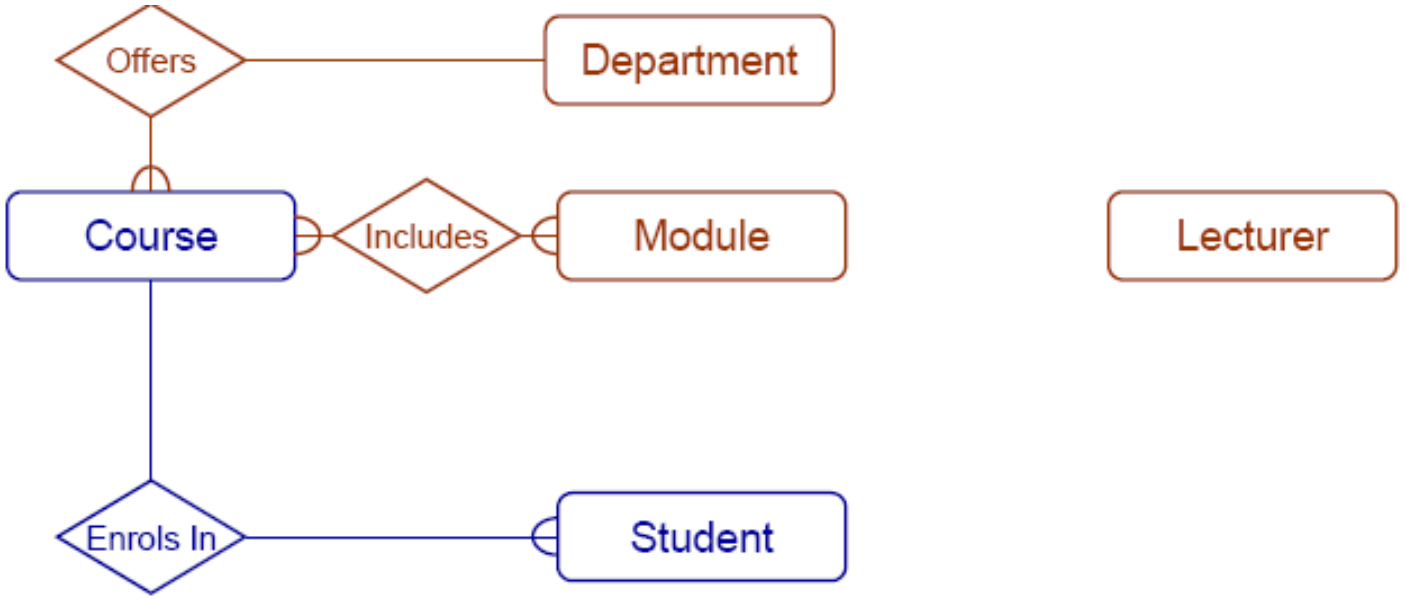
Example - E/R Diagram

* A number of modules make up each courses



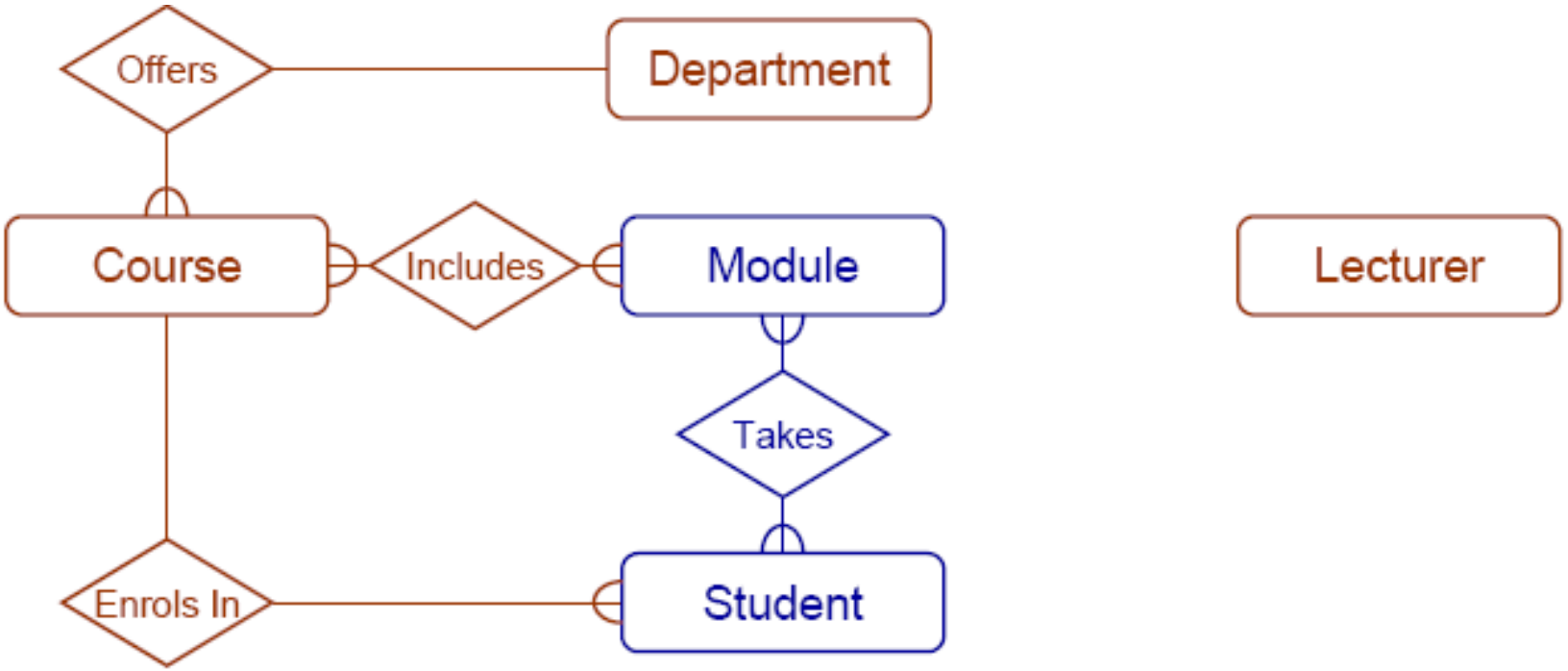
Example - E/R Diagram

* Students enrol in a particular course



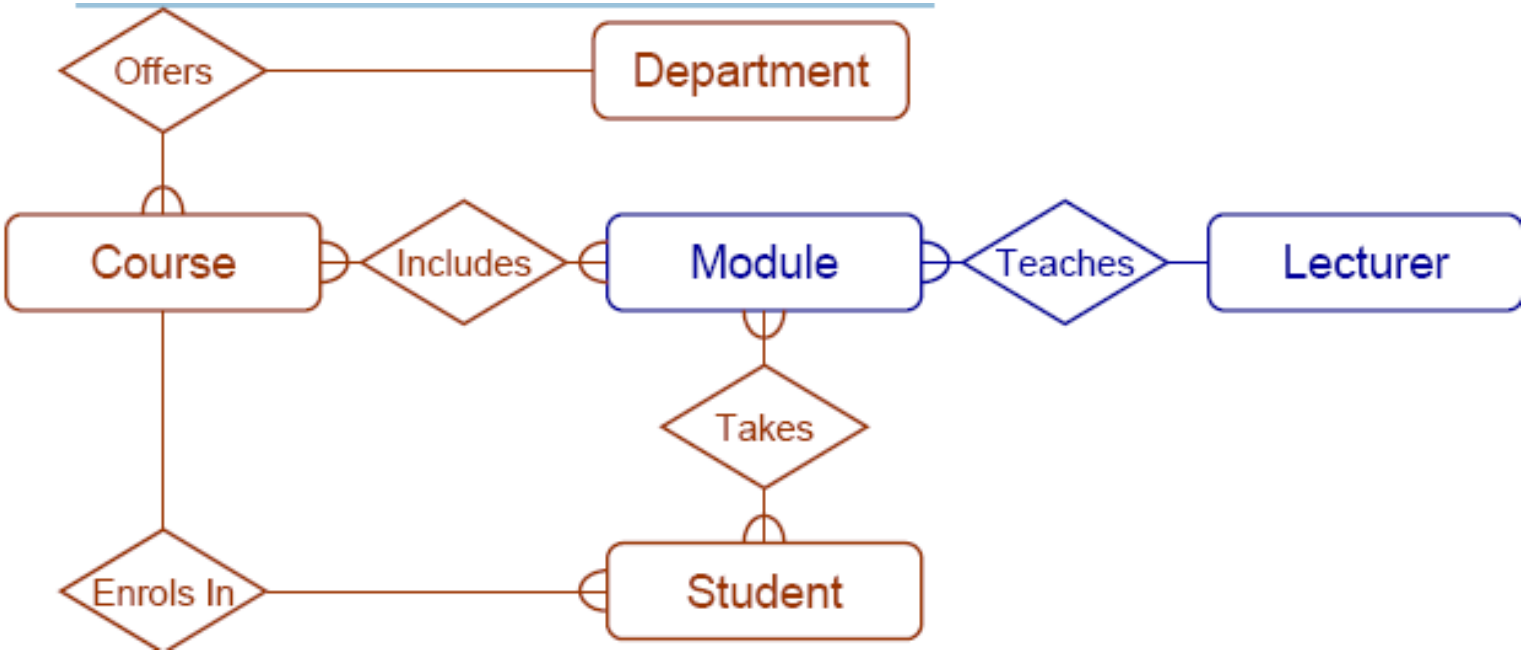
Example - E/R Diagram

* Students … take modules



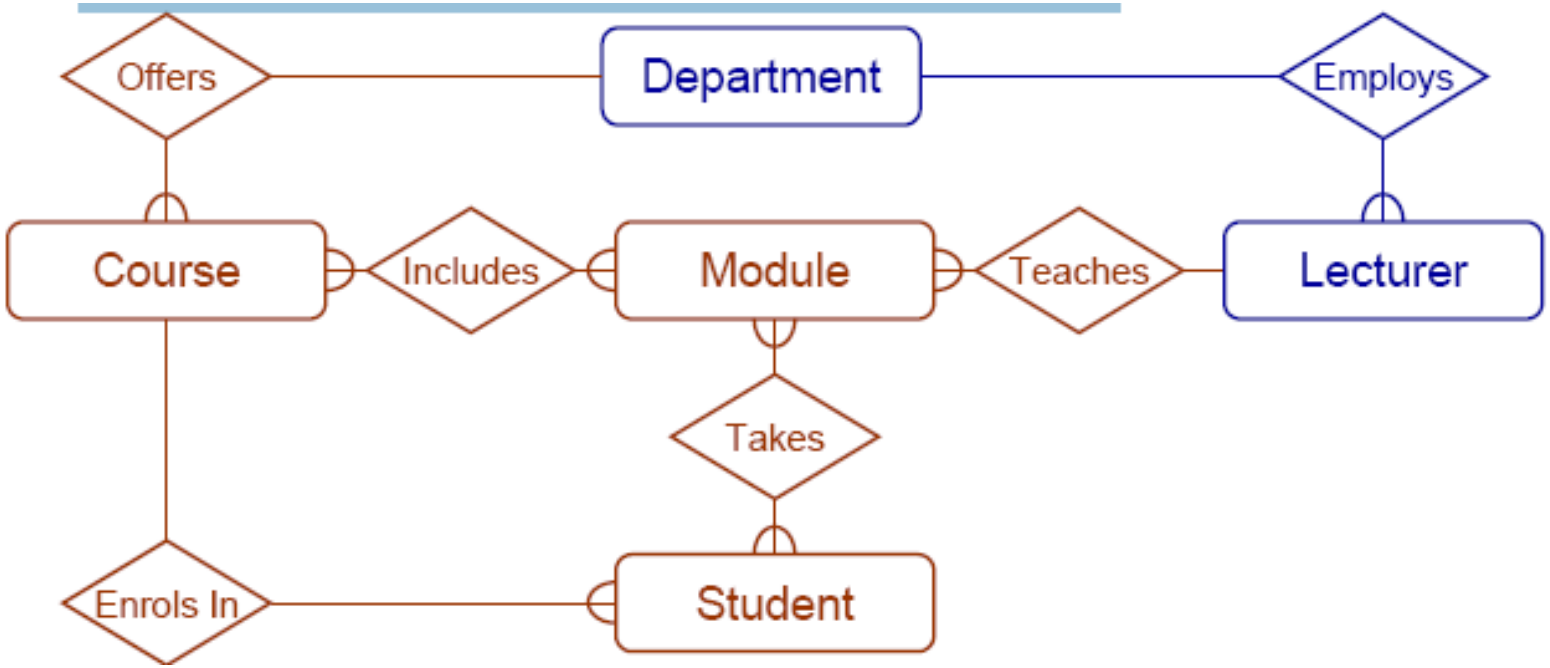
Example - E/R Diagram

* Each module is taught by a lecturer



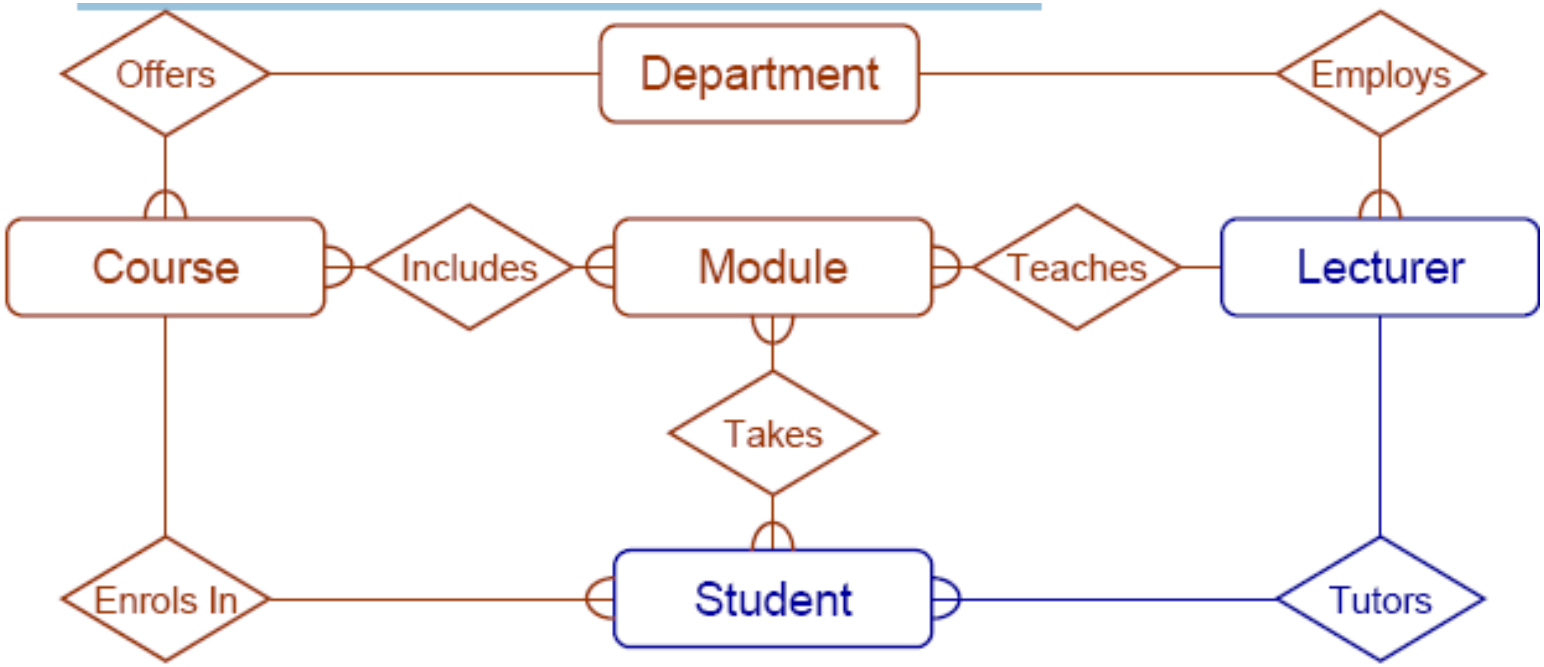
Example - E/R Diagram

* a lecturer from the appropriate department

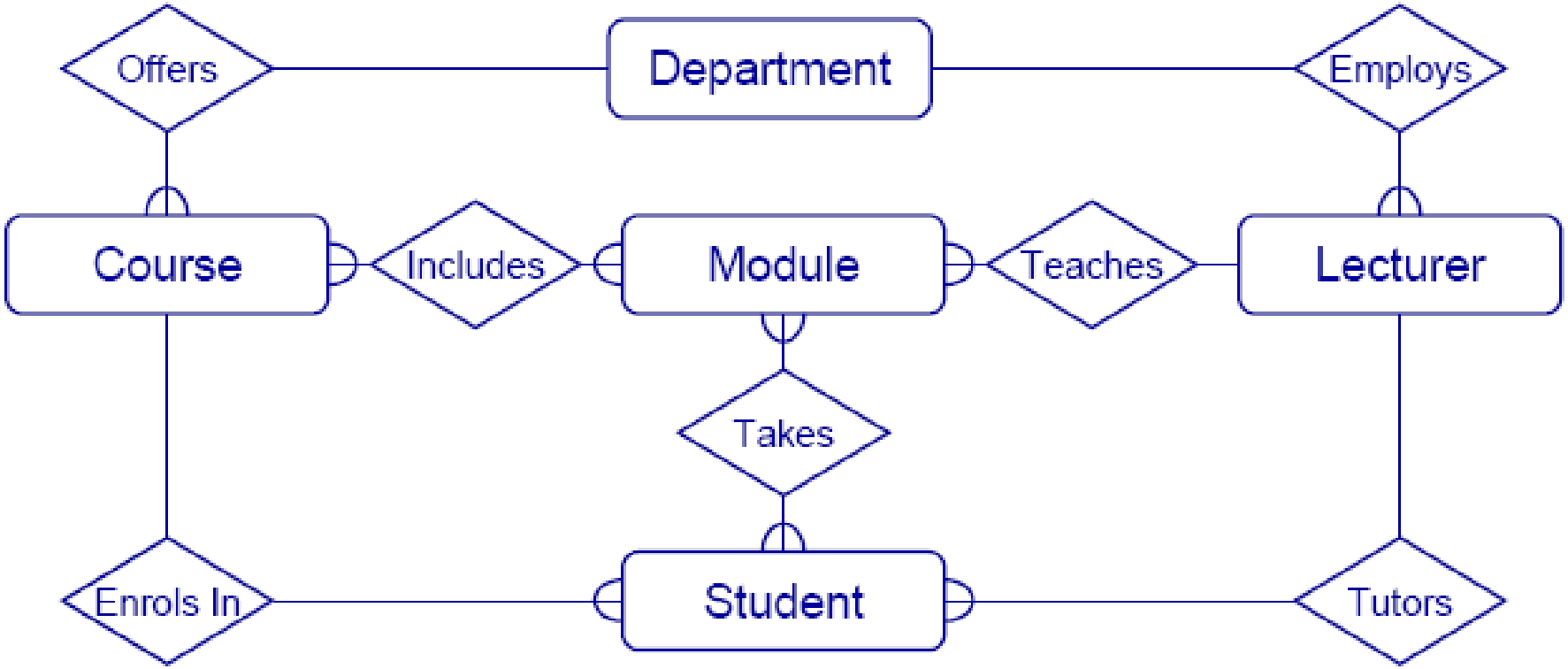


Example - E/R Diagram

* each lecturer tutors a group of students



Complete E/R Diagram



Question 1:Hospital System Grp 1

* “A database will be made to store information about patients in a hospital. On arrival, each patient’s personal details (name, address, and telephone number) are recorded where possible, and they are given an admission number. They are then assigned to a particular ward (Accident and Emergency, Cardiology, Oncology, etc.). In each ward there are a number of doctors and nurses. A patient will be treated by one doctor and several nurses over the course of their stay, and each doctor and nurse may be involved with several patients at any given time.”

Questions

* Identify the *entities*, *attributes*, *relationships*, and *cardinality ratios* from the description. (5 marks)
* Draw an entity-relationship diagram showing the items you identified. (5 marks)

Question 2: Bus Company grp 2

* *A Bus Company owns a number of buses. 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 buses 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*

Questions

* Identify the *entities*, *attributes*, *relationships*, and *cardinality ratios* from the description. (5 marks)
* Draw an entity-relationship diagram showing the items you identified. (5 marks)

Question 3:University Database grp 3

* *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."*

Questions

* Identify the *entities*, *attributes*, *relationships*, and *cardinality ratios* from the description. (5 marks)
* Draw an entity-relationship diagram showing the items you identified. (5 marks)

END of ERD

Next Lecture on

Normalization