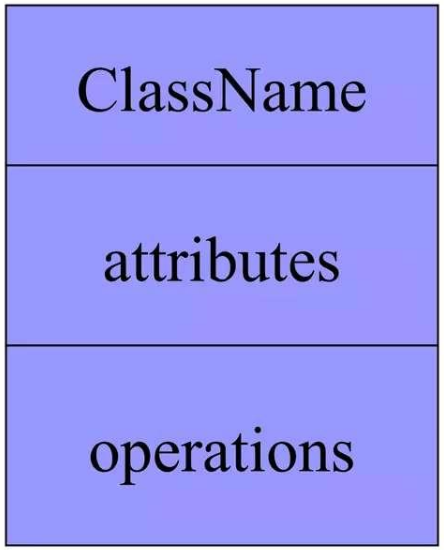
Class Diagram

Prof. Maitreyee Ganguly

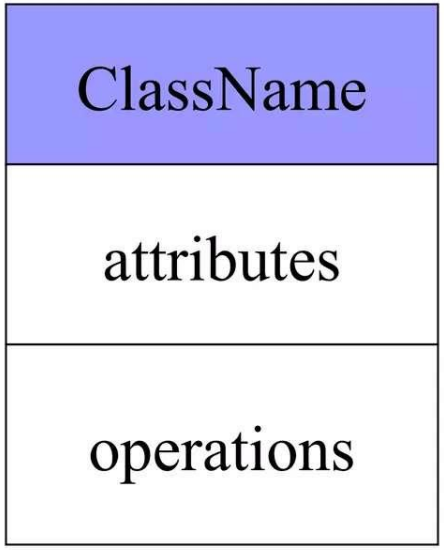
Classes



A *class* is a description of a set of objects that share the same attributes, operations, relationships, and semantics.

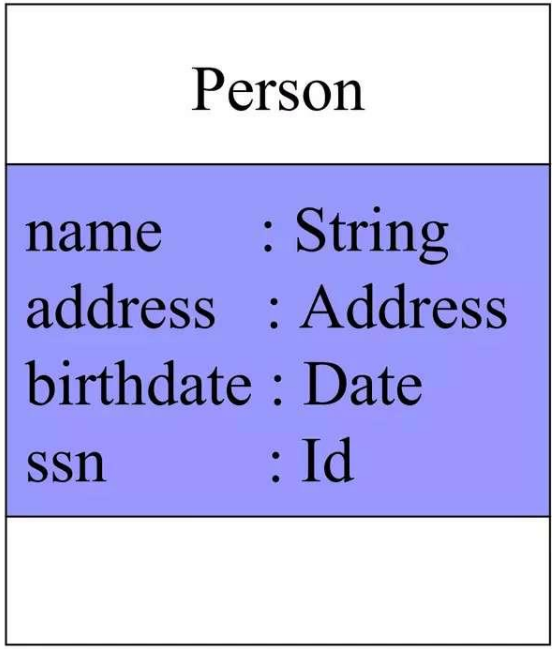
Graphically, a class is rendered as a rectangle, usually including its name, attributes, and operations in separate, designated compartments.

Class Names



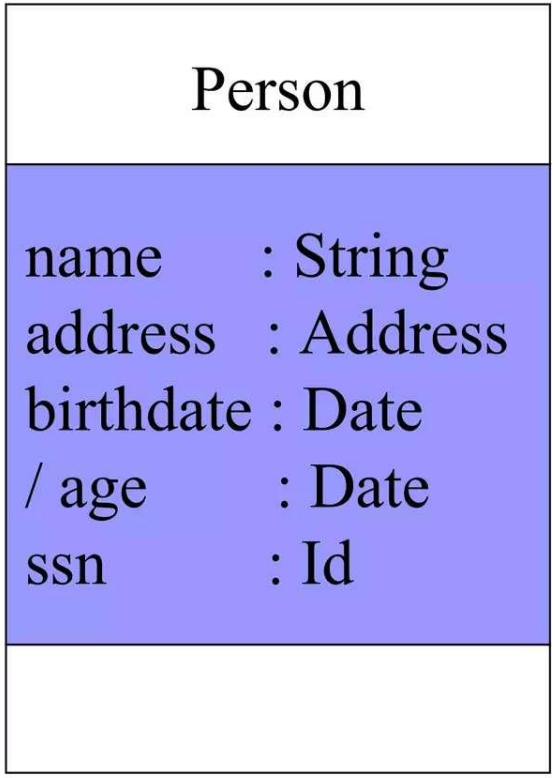
The name of the class is the only required tag in the graphical representation of a class. It always appears in the top-most compartment.

Class Attributes



An *attribute* is a named property of a class that describes the object being modeled. In the class diagram, attributes appear in the second compartment just below the name-compartment.

Class Attributes (Cont'd)



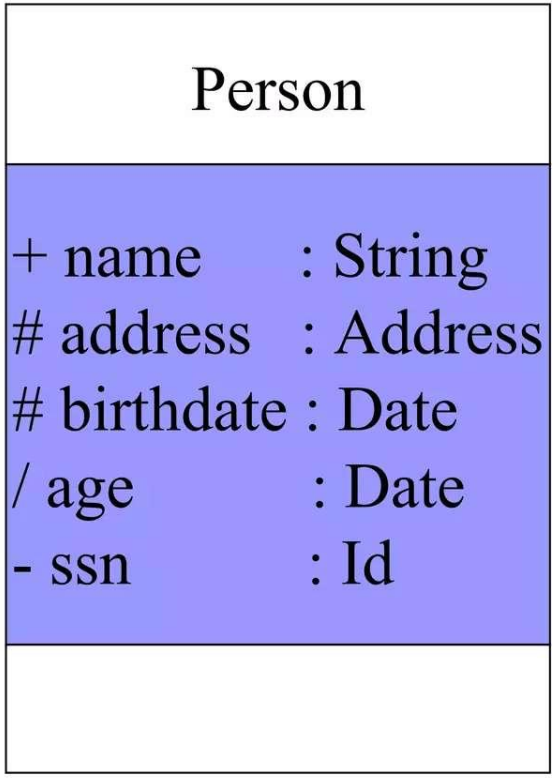
Attributes are usually listed in the form:

attributeName : Type

A *derived* attribute is one that can be computed from other attributes, but doesn't actually exist. For example, a Person's age can be computed from his birth date. A derived attribute is designated by a preceding '/' as in:

/ age : Date

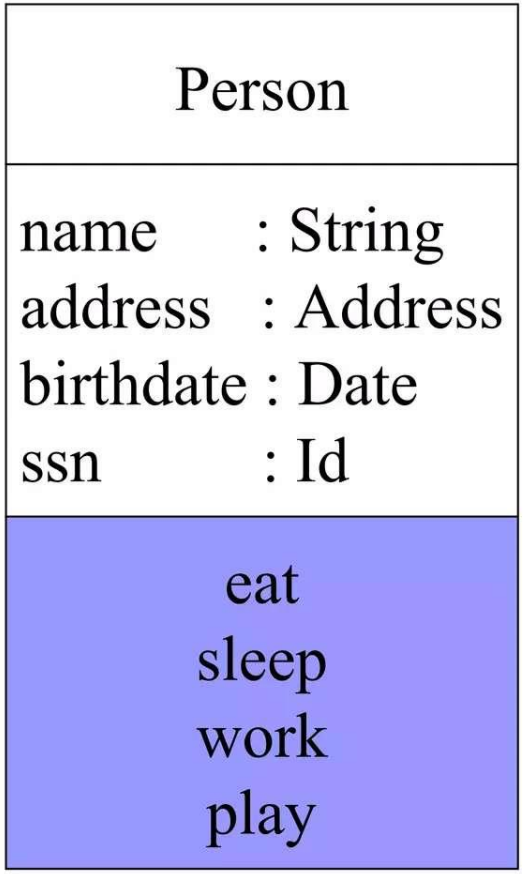
Class Attributes (Cont'd)



Attributes can be:

+ public
# protected
- private
/ derived

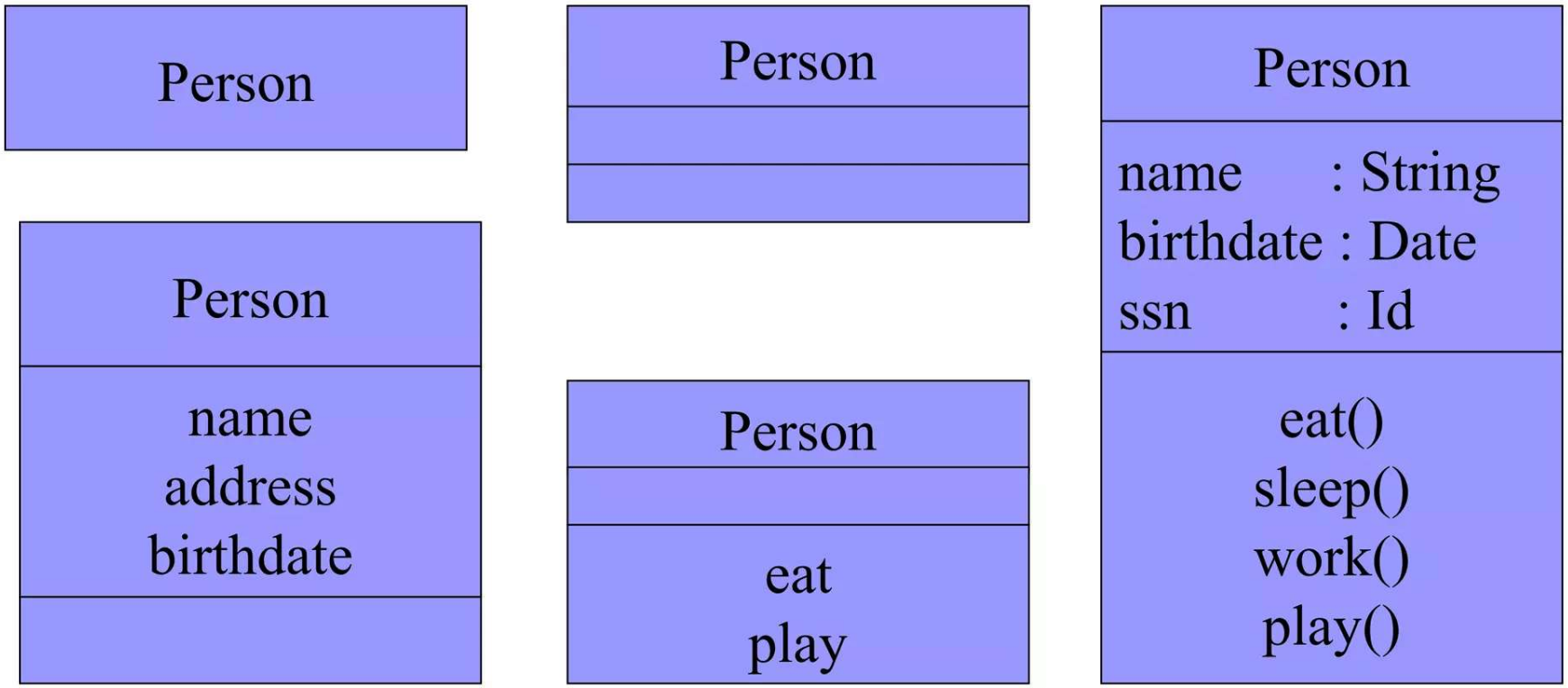
Class Operations



Operations describe the class behavior and appear in the third compartment.

Depicting Classes

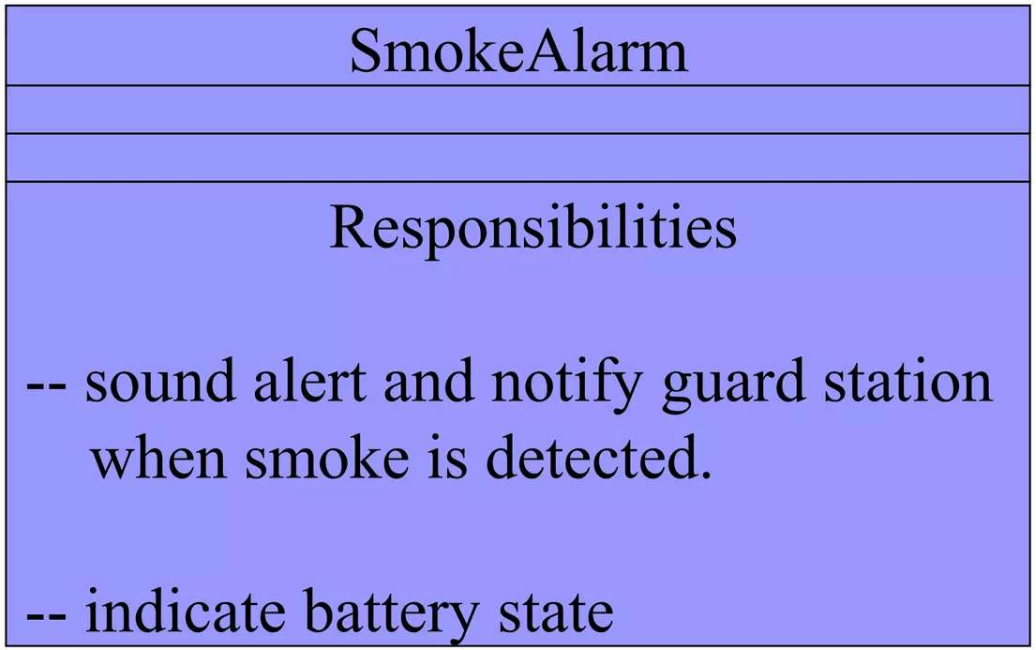
When drawing a class, you needn't show attributes and operation in every diagram.



Class Responsibilities

A class may also include its responsibilities in a class diagram.

A responsibility is a contract or obligation of a class to perform a particular service.



Relationships

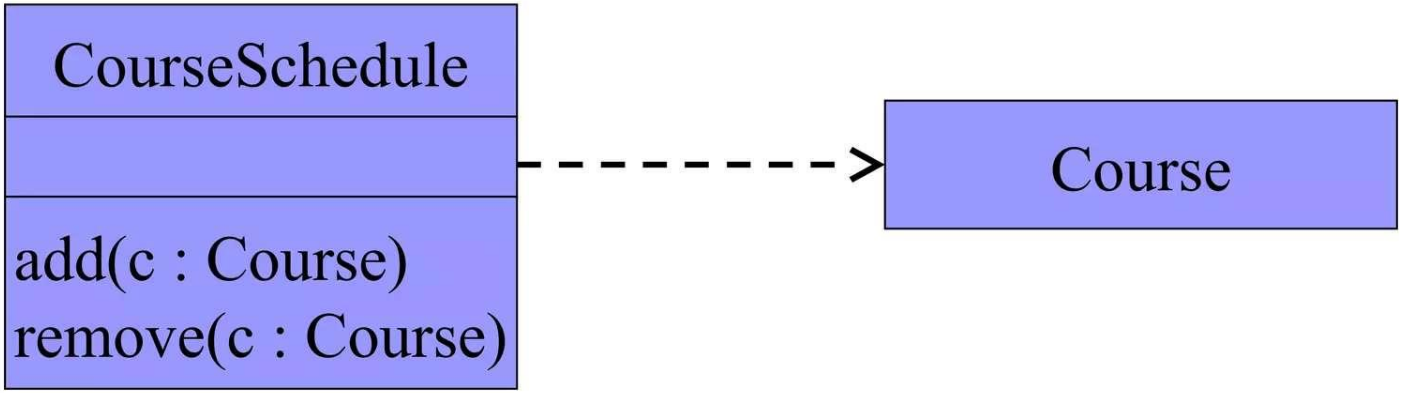
In UML, object interconnections (logical or physical), are modeled as relationships.

There are three kinds of relationships in UML:

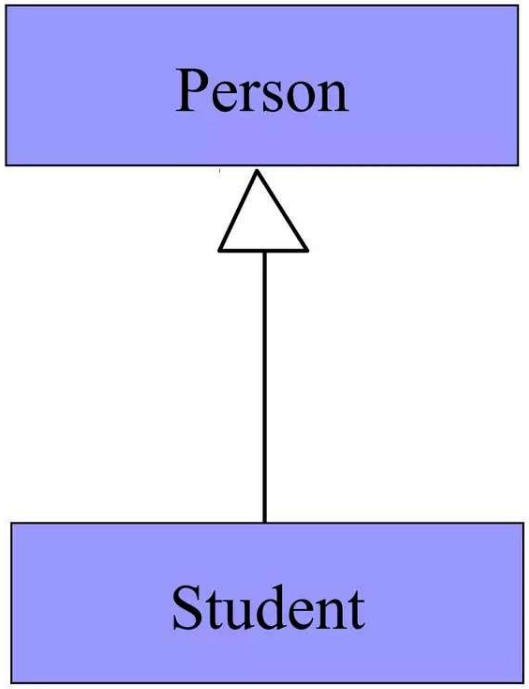
- dependencies
- generalizations
- associations

Dependency Relationships

A *dependency* indicates a semantic relationship between two or more elements. The dependency from *CourseSchedule* to *Course* exists because *Course* is used in both the **add** and **remove** operations of *CourseSchedule*.



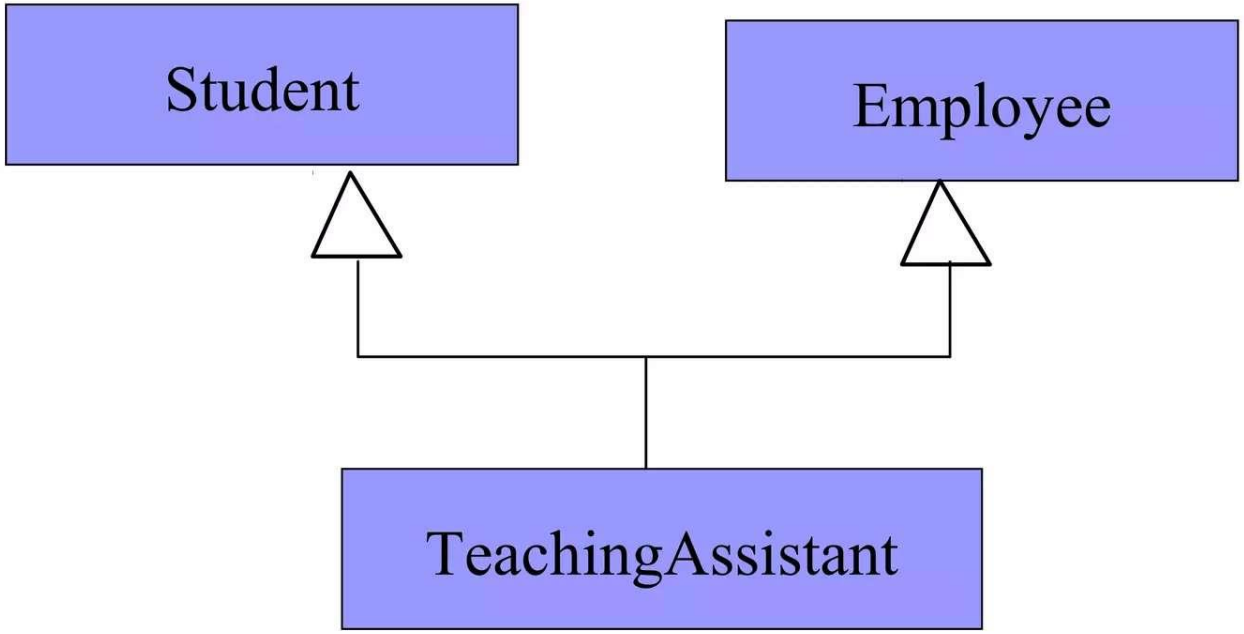
Generalization Relationships



A *generalization* connects a subclass to its superclass. It denotes an inheritance of attributes and behavior from the superclass to the subclass and indicates a specialization in the subclass of the more general superclass.

Generalization Relationships (Cont'd)

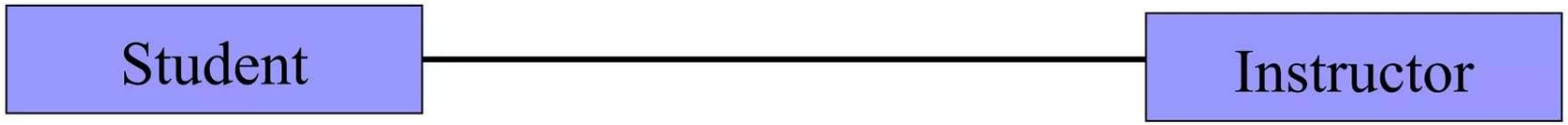
UML permits a class to inherit from multiple super classes, although some programming languages (*e.g.*, Java) do not permit multiple inheritance.



Association Relationships

If two classes in a model need to communicate with each other, there must be link between them.

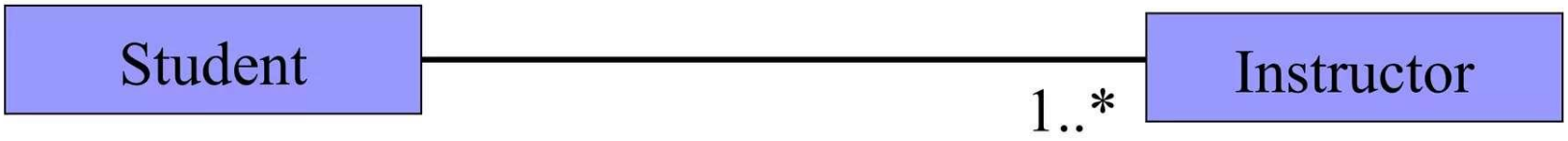
An *association* denotes that link.



Association Relationships (Cont'd)

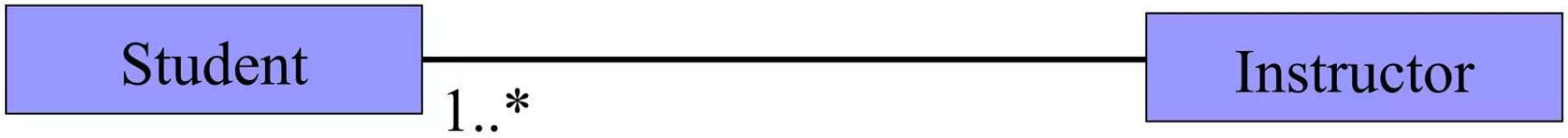
We can indicate the *multiplicity* of an association by adding *multiplicity adornments* to the line denoting the association.

The example indicates that a *Student* has one or more *Instructors*:



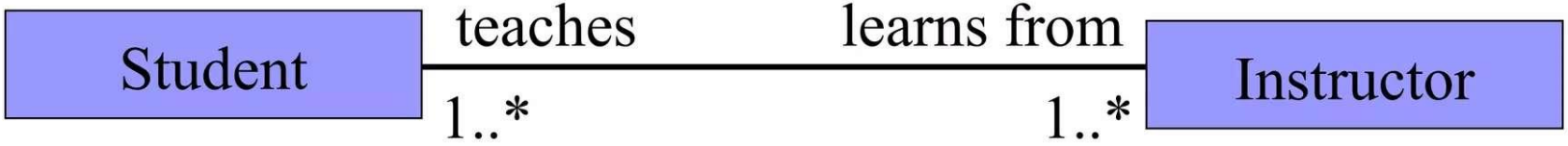
Association Relationships (Cont'd)

The example indicates that every *Instructor* has one or more *Students*:



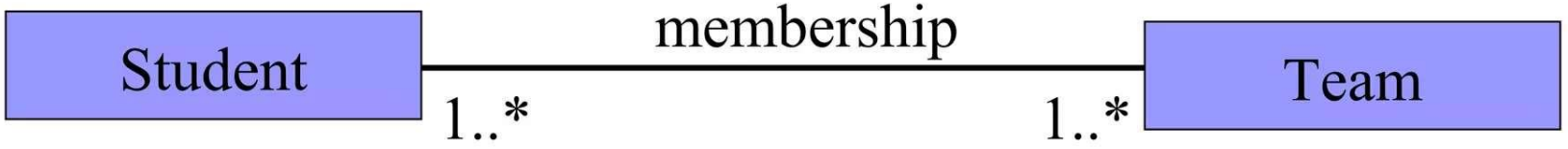
Association Relationships (Cont'd)

We can also indicate the behavior of an object in an association (*i.e.,* the *role* of an object) using *role names*.



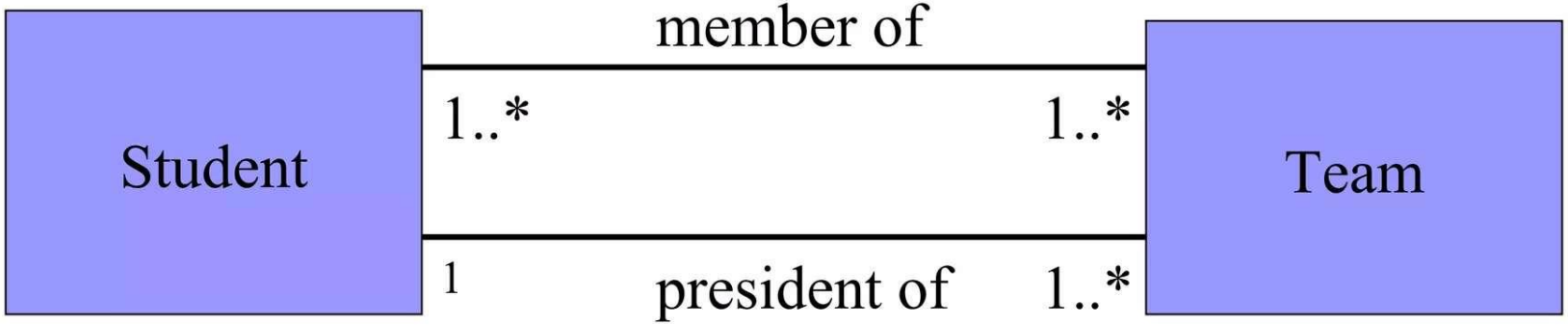
Association Relationships (Cont'd)

We can also name the association.



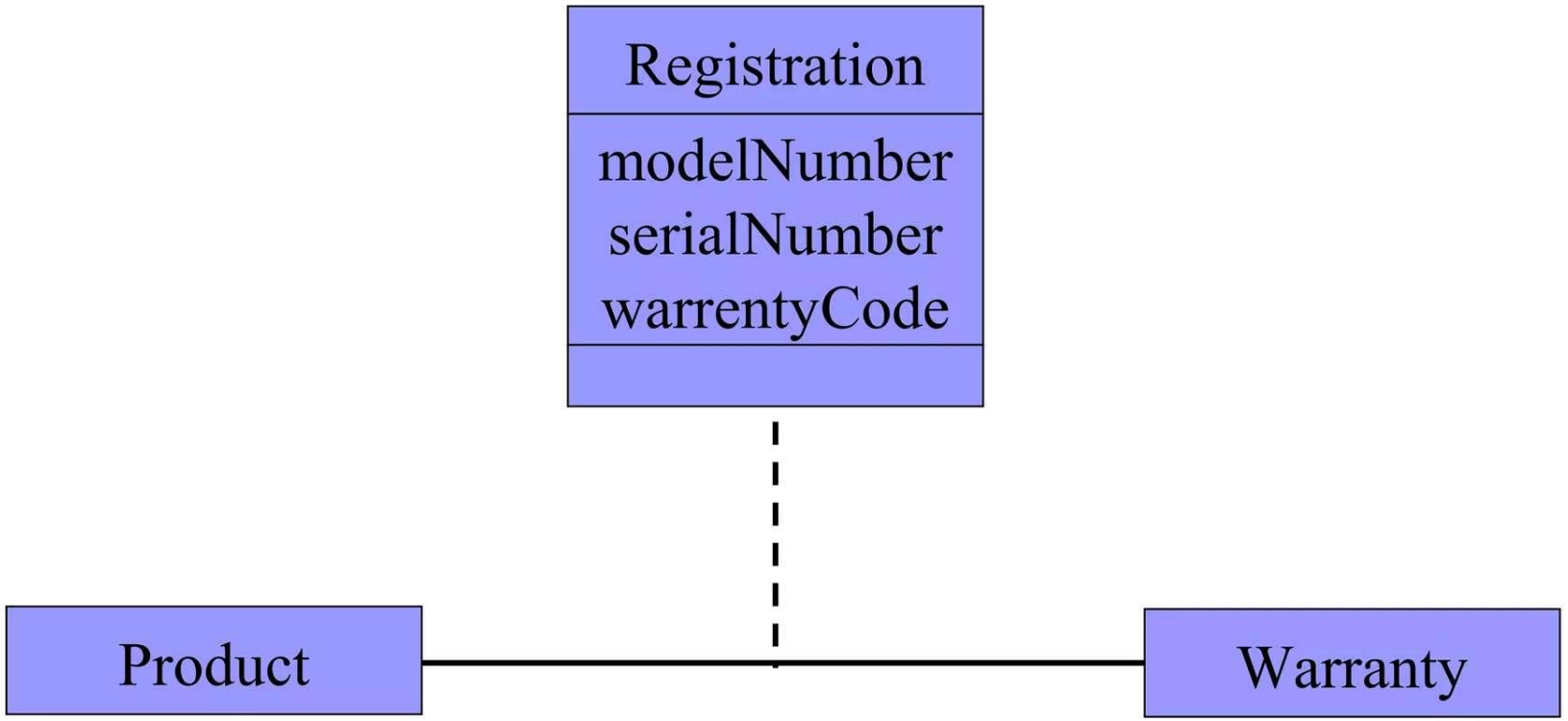
Association Relationships (Cont'd)

We can specify dual associations.

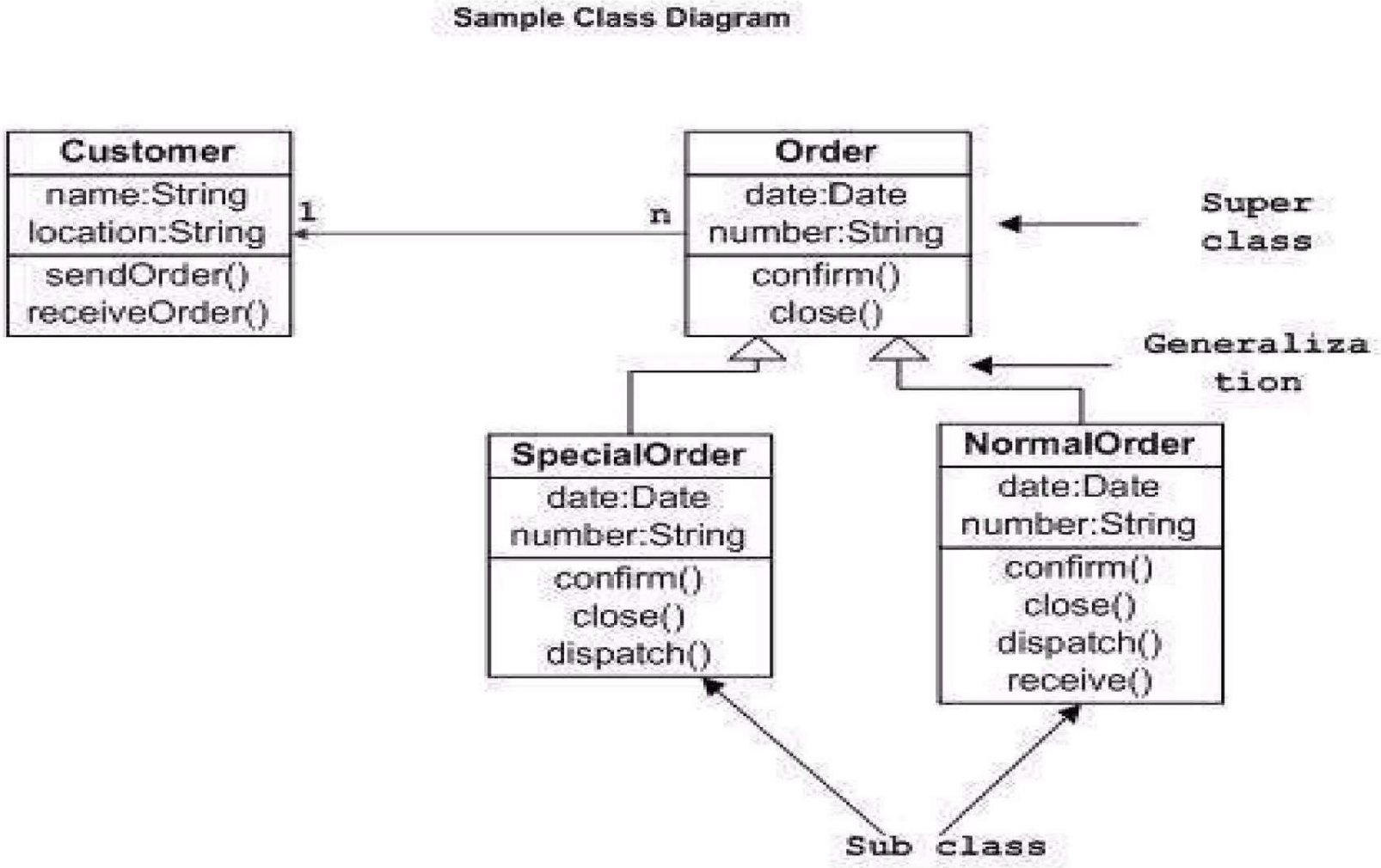


Association Relationships (Cont'd)

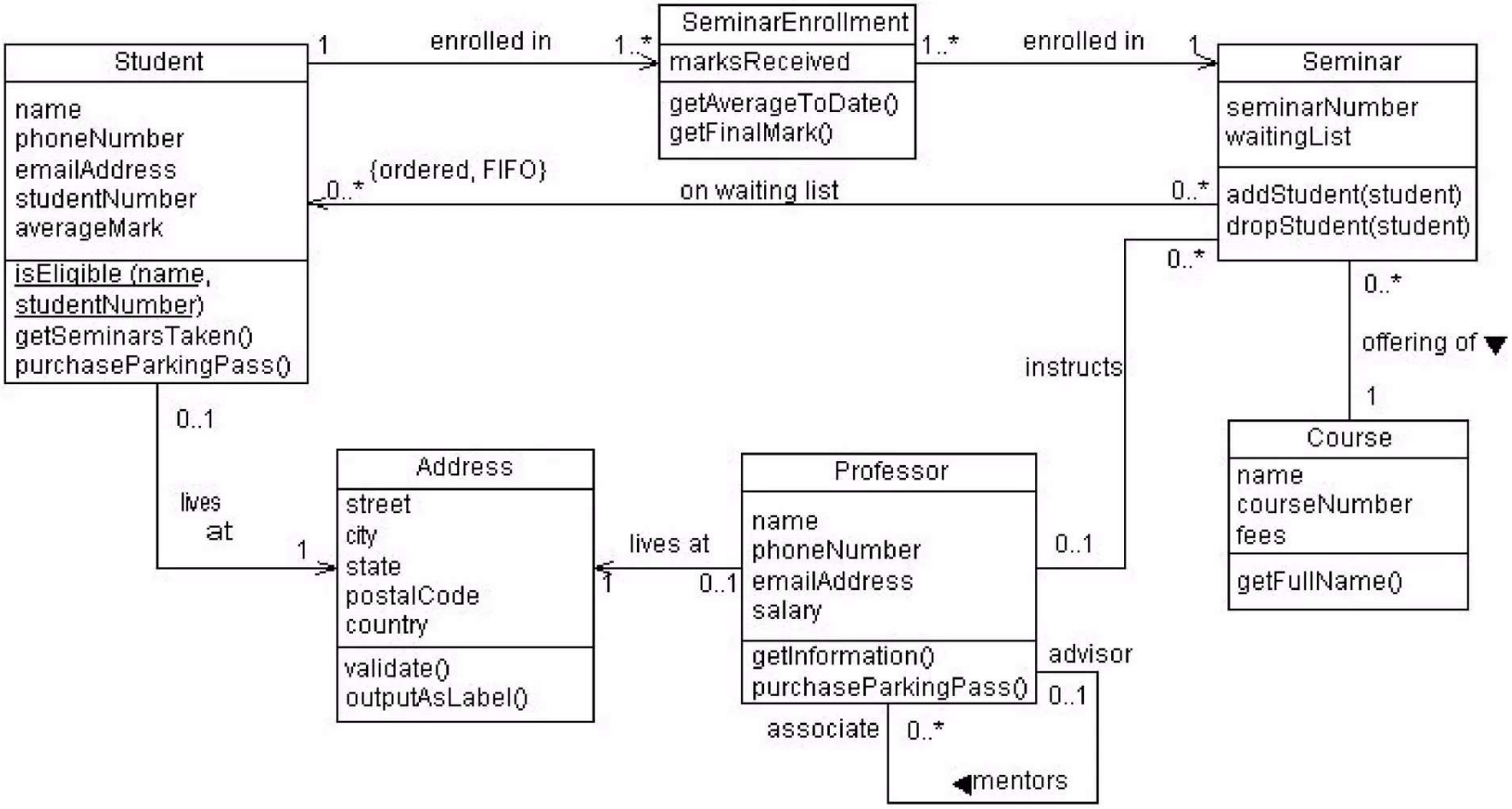
Associations can also be objects themselves, called *link classes* or an *association classes*.



Example


Sample Class Diagram
Customer
name:String
location:String
sendOrder()
receiveOrder()
1
n
Order
date:Date
number:String
confirm()
close()
Super class
Generalization
SpecialOrder
date:Date
number:String
confirm()
close()
dispatch()
NormalOrder
date:Date
number:String
confirm()
close()
dispatch()
receive()
Sub class

Example


Student
name
phoneNumber
emailAddress
studentNumber
averageMark
isEligible (name, studentNumber)
getSeminarsTaken()
purchaseParkingPass()
1
enrolled in
1..*
SeminarEnrollment
marksReceived
getAverageToDate()
getFinalMark()
1..*
enrolled in
1
Seminar
seminarNumber
waitingList
addStudent(student)
dropStudent(student)
0..*
{ordered, FIFO}
on waiting list
0..*
0..*
instructs
0..*
offering of
1
Course
name
courseNumber
fees
getFullName()
0..1
lives at
1
Address
street
city
state
postalCode
country
validate()
outputAsLabel()
lives at
1
0..1
Professor
name
phoneNumber
emailAddress
salary
getInformation()
purchaseParkingPass()
0..1
advisor
0..1
associate
0..*
mentors