

# **CS 407**

## **Design Patterns**

### **UML Modeling part 3**

Dr. Chad Williams  
Central Connecticut State University

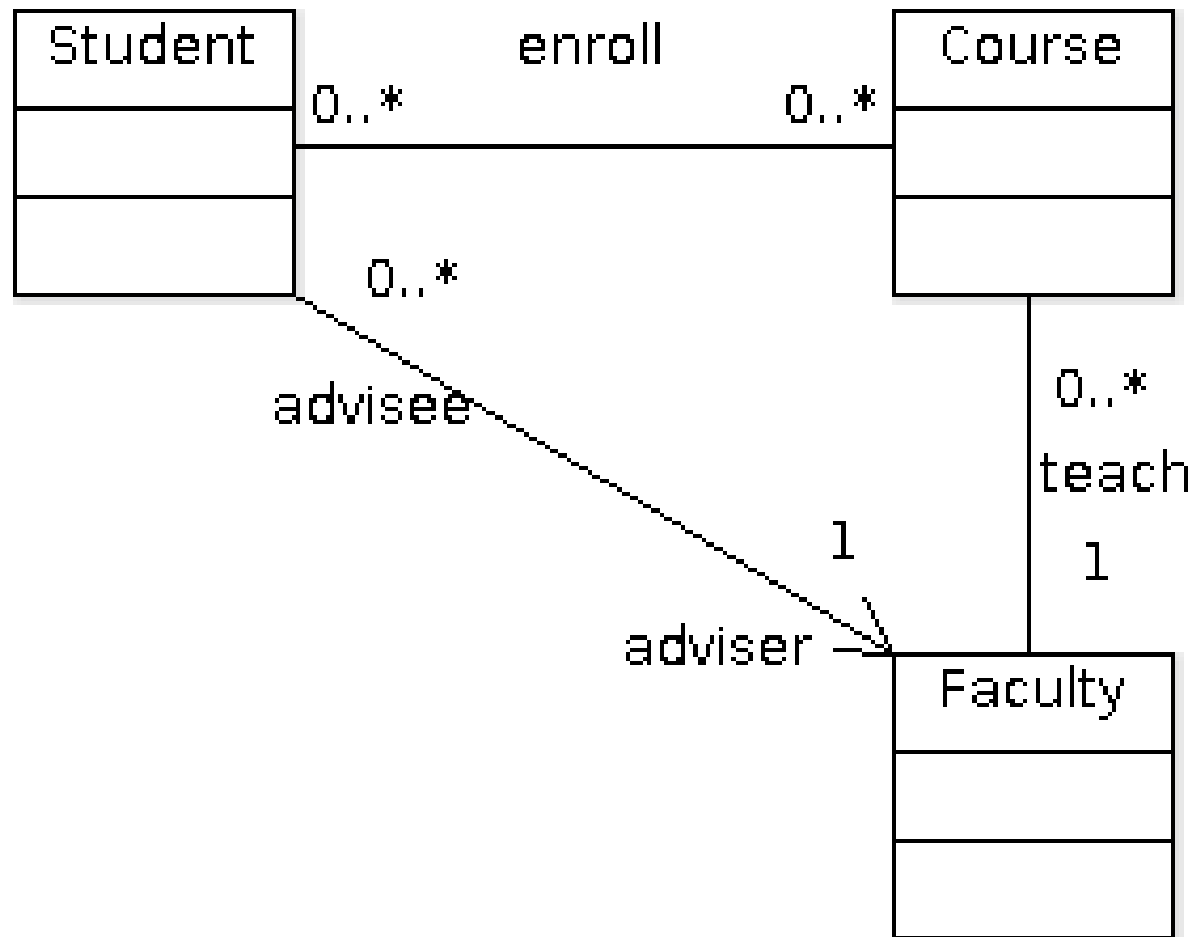
# Topics

- Association
- Aggregation
- Composition
- Dependency

# Association

- Represents a relationship between classes
  - Role name between classes
  - Multiplicity of relationship between classes
  - Navigability of relationship

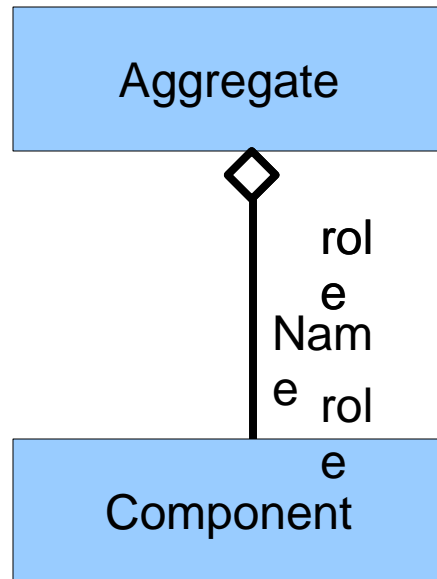
# Sample association



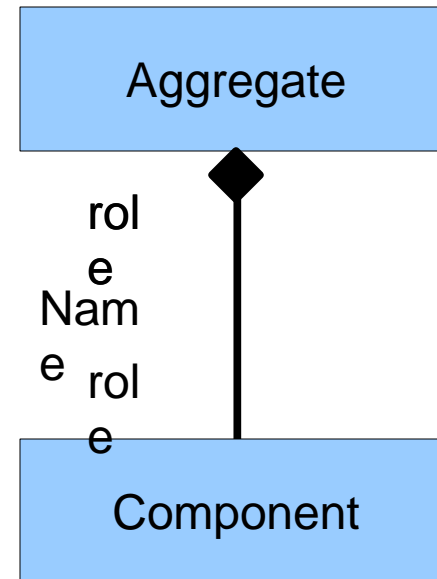
# Aggregation and composition

- Aggregation - special form of association
  - Has-a or part-whole
  - Aggregate class form parts of component class
- Composition – stronger form of aggregation
  - The lifetime of the aggregate class is contained by component class

# Graphical representation

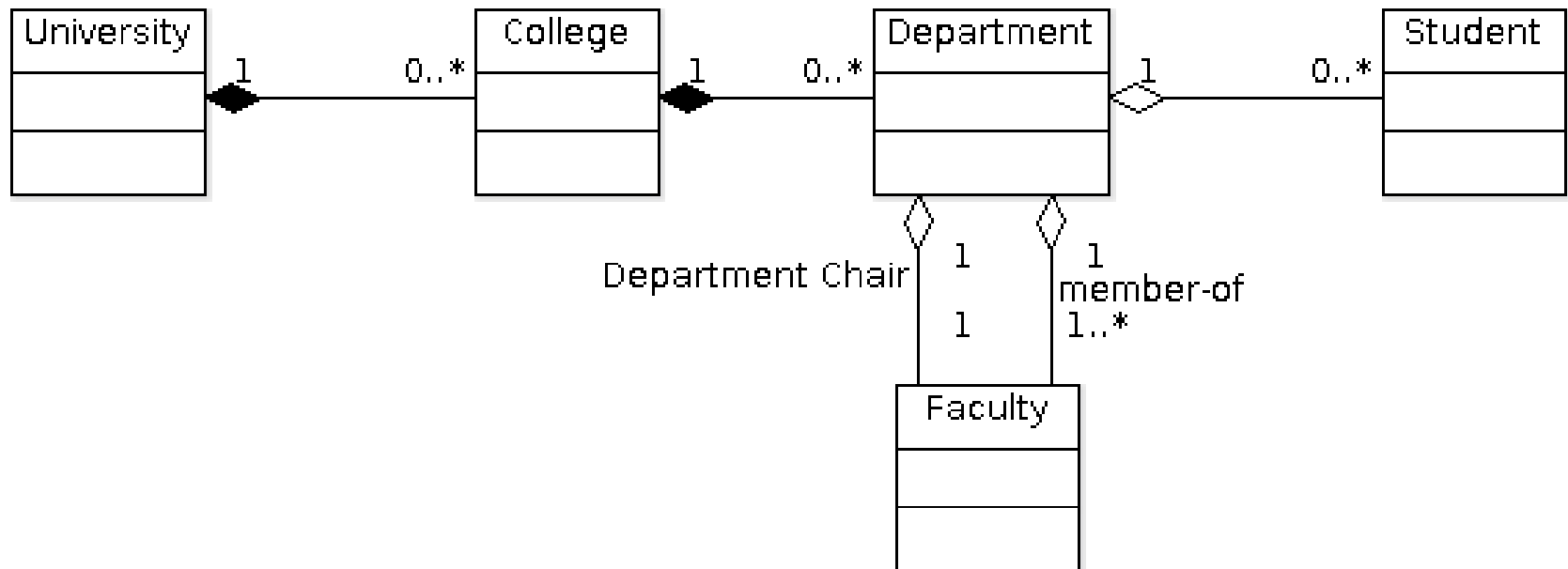


Aggregation  
n



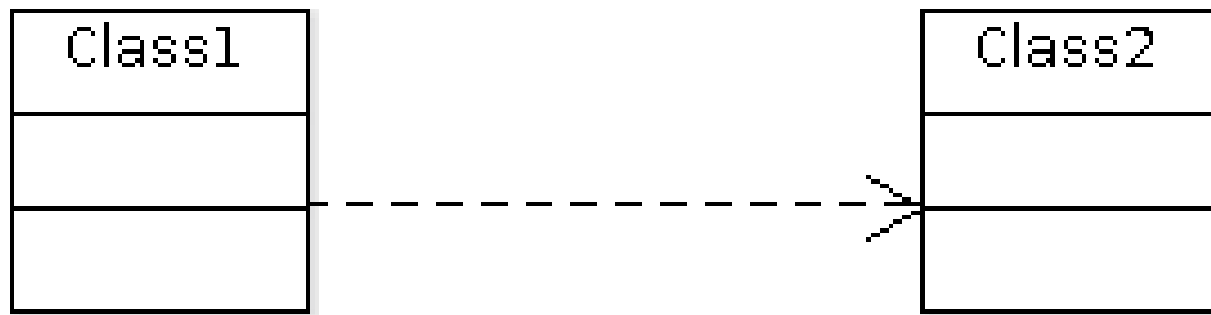
Composition  
n

# Aggregation example



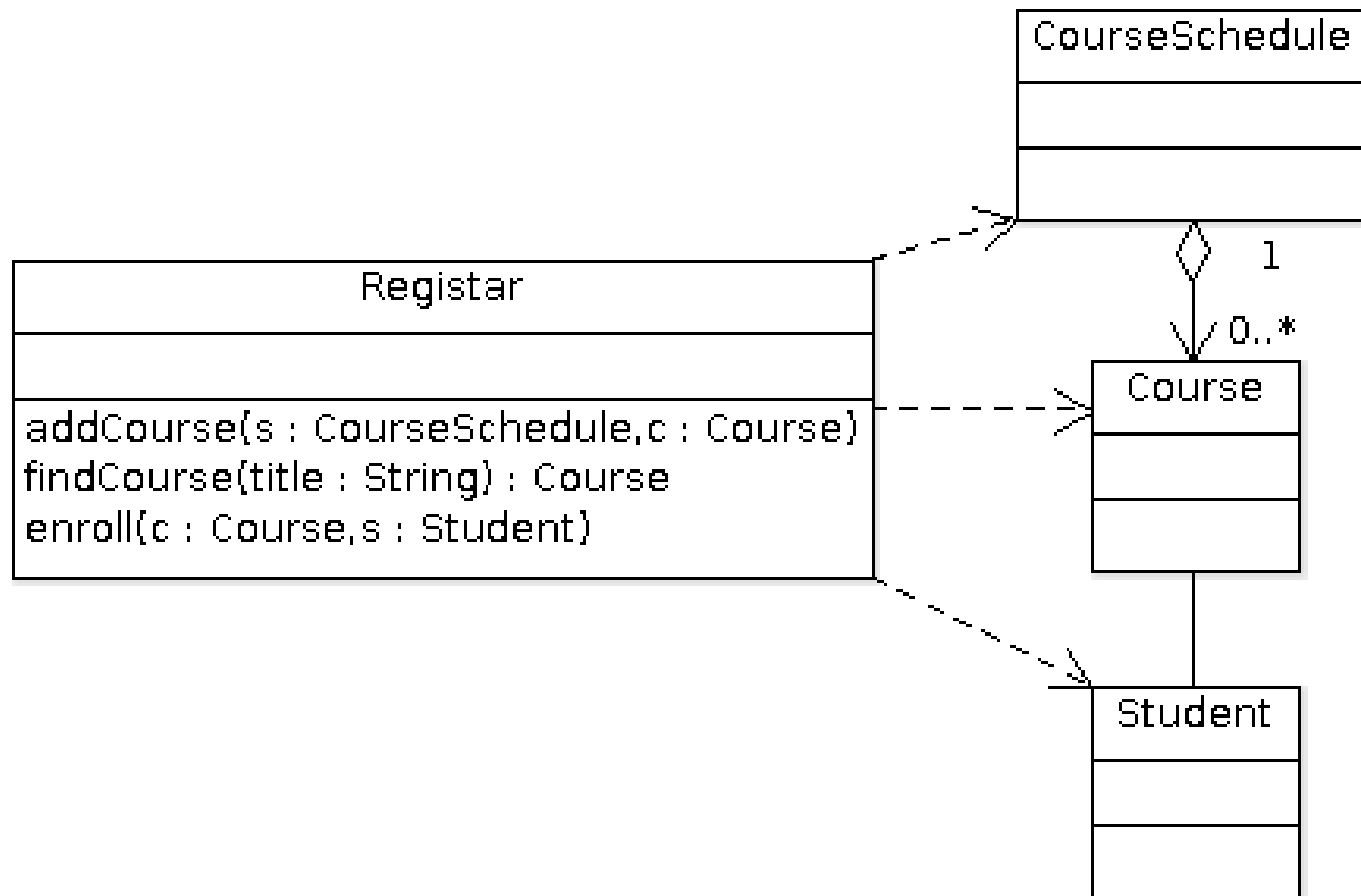
# Dependency

- Represents proper operation of one class dependent on another class
- Common form is class being used as parameter or local variable





# Dependency example



# Group work

- Create an object model of a company
  - Multiple departments each with multiple workers
  - A worker can be either an employee or an intern, where the employee and intern classes are mutually exclusive (i.e. Worker should be an interface)
  - Head of each department is a manager
  - Manager is specialization of an employee
  - Employee has 0 or more addresses and the employee has a link to address but not vice versa
  - HumanResources class has operations to create employees and managers and assign them to departments. It also maintains a list of all employees
- Draw the following where applicable:
  - Inheritance, realization, association/aggregation/composition, dependency, numerocity

