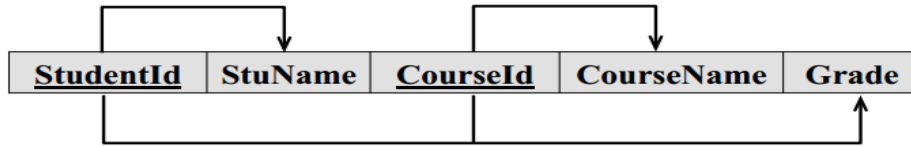


## Second Normal Form (2NF)

- 1NF PLUS **every non-key attribute is fully functionally dependent on the ENTIRE primary key**
  - Every non-key attribute must be defined by the entire key, not by only part of the key

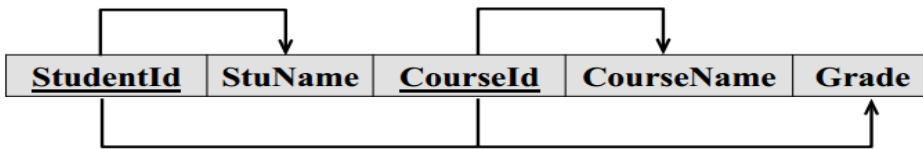
### Functional Dependencies in Student



Can represent FDs with arrows as above, or

- $\text{StudentId} \rightarrow \text{StuName}$ ,
- $\text{CourseId} \rightarrow \text{CourseName}$
- $\text{StudentId}, \text{CourseId} \rightarrow \text{Grade}$  (and StuName, CourseName)

### Functional Dependencies in Student



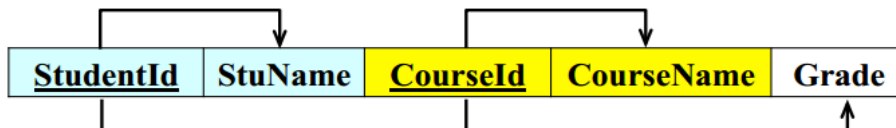
Can represent FDs with arrows as above, or

- $\text{StudentId} \rightarrow \text{StuName}$ ,
- $\text{CourseId} \rightarrow \text{CourseName}$
- $\text{StudentId}, \text{CourseId} \rightarrow \text{Grade}$  (and StuName, CourseName)

**Therefore, NOT in 2<sup>nd</sup> Normal Form!!**

## 2NF: Normalizing

- How do we convert the partial dependencies into normal ones ? By breaking into more tables.



- Becomes ... (notice above arrows mean functional dependency, below they mean FK constraints)

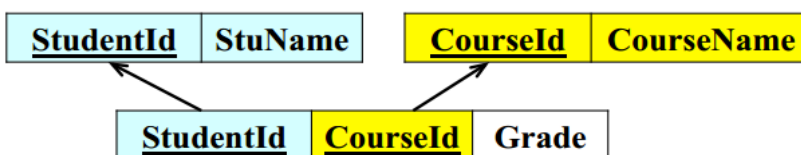


Figure: 4-22 Steps in Normalization

