Business School
UNIVERSITY OF COLORADO DENVER

Information Systems Program

Module 11
Normalization Concepts and Practice

Lesson 2: Functional dependencies

Lesson Objectives

- Define functional dependency
- Explain analogy of functional dependency to unique constraint
- Falsify functional dependencies in sample rows

Functional Dependency Basics

- Constraint on the possible rows in a table
- Value neutral like FKs and PKs
- Asserted
- Understand business rules

FD Definition

- Notation: $X \rightarrow Y$
- X (functionally) determines Y
- For each X value, there is at most one Y value
- StdNo $\rightarrow$ StdCity if each StdNo value has at most one StdCity value
- X: left-hand side (LHS) or determinant
- Y: right-hand side (RHS)

Unique Constraint Analogy

- Like uniqueness constraint
- Place RHS and LHS in a table by themselves
- Examples
  - OfferNo → OffYear
  - OfferNo, StdNo → EnrGrade

StdNo	StdClass	OfferNo	OffYear	EnrGrade	CourseNo	CrsDesc
S1	JUN	O1	2020	3.5	C1	DB
S1	JUN	O2	2020	3.3	C2	VB
S2	JUN	O3	2021	3.1	C3	OO
S2	JUN	O2	2020	3.4	C2	VB

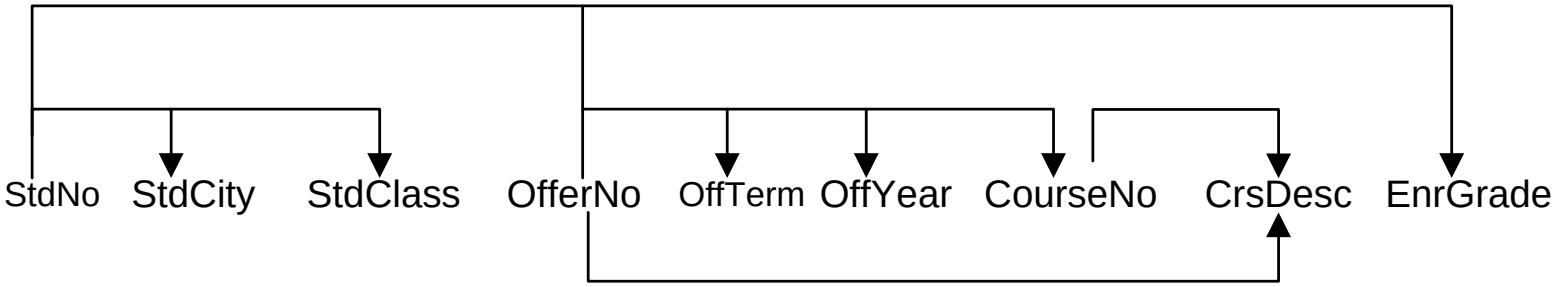
FD Lists and Diagrams

StdNo → StdCity, StdClass

OfferNo → OffTerm, OffYear, CourseNo, CrsDesc

CourseNo → CrsDesc

StdNo, OfferNo → EnrGrade



Falsification of FDs using Sample Rows

- Prove non-existence (but not existence) by looking at data
- Two rows that have the same X value but a different Y value

StdNo	StdClass	OfferNo	OffYear	EnrGrade	CourseNo	CrsDesc
S1	JUN	O1	2020	3.5	C1	DB
S1	JUN	O2	2020	3.3	C2	VB
S2	JUN	O3	2021	3.1	C3	OO
S2	JUN	O2	2020	3.4	C2	VB

Summary

- FDs are important constraints
- Asserting FDs is essential for removing unwanted redundancy
- Refinement activity