

Student(sid, name, addr, age, GPA)

sid	name	addr	age	GPA
301	John	183 Westwood	19	2.1
303	Elaine	301 Wilshire	17	3.9
401	James	183 Westwood	17	3.5
208	Esther	421 Wilshire	20	3.1

Class(dept, cnum, sec, unit, title, instructor)

dept	cnum	sec	unit	title	instructor
CS	112	01	03	Modeling	Dick Muntz
CS	143	01	04	DB Systems	Carlo Zaniolo
EE	143	01	03	Signal	Dick Muntz
ME	183	02	05	Mechanics	Susan Tracey

Enroll(sid, dept, cnum, sec)

sid	dept	cnum	sec
301	CS	112	01
301	CS	143	01
303	EE	143	01
303	CS	112	01
401	CS	112	01

Schema definition (table creation)

Course (dept, cnum, sec, unit, instructor, title)

```
CREATE TABLE Course (  
    dept CHAR(2) NOT NULL,  
    cnum INTEGER NOT NULL,  
    sec INTEGER NOT NULL,  
    unit INTEGER,  
    instructor VARCHAR(30) ,  
    title VARCHAR(30) ,  
    PRIMARY KEY (dept, cnum, sec) )
```

Basic SQL types

- String
 - Char(n): fixed length. Padded
 - Varchar(n): variable length
- Number
 - Integer: 32 bit
 - Decimal(5,2): 999.99
 - Real, Double: 32 bit, 64 bit
- Datetime
 - Date: '2002-01-15'
 - Time: '13:40:00'
 - Timestamp: '2002-01-15 13:40:00'

Schema definition (table creation)

Course (dept, cnum, sec, unit, instructor, title)

Course (dept, cnum, sec, unit, instructor, title)

Course (dept, cnum, sec, unit, instructor, title)

```
CREATE TABLE Course (  
    dept CHAR(2) NOT NULL DEFAULT 'CS' ,  
    cnum INTEGER NOT NULL ,  
    sec INTEGER NOT NULL ,  
    unit INTEGER ,  
    instructor VARCHAR(30) ,  
    title VARCHAR(30) DEFAULT ,  
    PRIMARY KEY (dept, cnum, sec)  
    UNIQUE (dept, cnum, instructor) ,  
    UNIQUE (dept, sec, title) )
```

Referential Integrity Constraint

```
CREATE TABLE Enroll (  
    sid INT REFERENCES Student(sid),  
    dept CHAR(2),  
    cnum INT,  
    sec INT,  
    FOREIGN KEY (dept, cnum, sec)  
        REFERENCES Class(dept, cnum, sec)  
        ON DELETE CASCADE  
        ON UPDATE SET NULL )
```

- Notes

- Referencing attributes called FOREIGN KEY
- Referenced attributes must be PRIMARY KEY or UNIQUE

DDL and DML

- This is the basic Data Definition Language (DDL) which is also part of SQL standards
- The core part of SQL is the Data Manipulation Language (DML), which consists of two parts:
 - The query language proper, and
 - The update language