SWEN-220
Mathematical Models of Software

Course Registration Relational Mapping
&
SQL Create Table Statements
Converting the Multivalued Attribute “emails”

Teachers( collegeld, first, last, office, email )
Courses( dept, cnum, title, hours )
Sections( dept, cnum, snum, room, time )
Students( collegeld, first, last )
Emails( collegeld, email )

collegeld refers to collegeld in Students
Converting the "Teach" Relationship (1 : N)

Teachers( collegeld, first, last, office, email )
Courses( dept, cnum, title, hours )
Sections( dept, cnum, snum, room, time )
Students( collegeld, first, last )

Emails( collegeld, email )

collegeld refers to collegeld in Students
Converting the "Teach" Relationship (1 : N)

Teacher:
- collegeld
- first
- last
- office
- email

Courses:
- dept
- cnum
- title
- hours

Sections:
- dept
- cnum
- snum
- room
- time
- teacher (collegeID in Teachers)

Students:
- collegeld
- first
- last

Emails:
- collegeld
- email (collegeID refers to collegeld in Students)
Converting the "Offered" Relationship (1 : N)

Teachers( collegeld, first, last, office, email )
Courses( dept, cnum, title, hours )
Sections( dept, cnum, snum, room, time, teacher )
  teacher refers to collegeld in Teachers
Students( collegeld, first, last )
Emails( collegeld, email )
  collegeld refers to collegeld in Students
Converting the "Offered" Relationship (1 : N)

Teachers( collegeld, first, last, office, email )
Courses( dept, cnum, title, hours )
Sections( dept, cnum, snum, room, time, teacher )
  teacher refers to collegelId in Teachers
  (dept, cnum) refers to (dept, cnum) in Courses
Students( collegeld, first, last )
Emails( collegeld, email )
collegeld refers to collegeld in Students
Converting the "Enroll" Relationship (M : N)

Teachers( collegeld, first, last, office, email )
Courses( dept, cnum, title, hours )
Sections( dept, cnum, snum, room, time, teacher )
  teacher refers to collegeld in Teachers
  (dept, cnum) refers to (dept, cnum) in Courses
Students( collegeld, first, last )
Emails( collegeld, email )
  collegeld refers to collegeld in Students

[Diagram of relationships between Student, Enroll, Section, with collegeld, dept, cnum, snum, and emails]
Converting the "Enroll" Relationship (M : N)

Teachers( collegid, first, last, office, email )
Courses( dept, cnum, title, hours )
Sections( dept, cnum, snum, room, time, teacher )
  teacher refers to collegid in Teachers
  (dept, cnum) refers to (dept, cnum) in Courses
Students( collegid, first, last )
Emails( collegid, email )
  collegid refers to collegid in Students
Enroll( student, dept, cnum, snum )
Converting the "Enroll" Relationship (M : N)

Teachers( collegeId, first, last, office, email )
Courses( dept, cnum, title, hours )
Sections( dept, cnum, snum, room, time, teacher )
  teacher refers to collegeID in Teachers
  (dept, cnum) refers to (dept, cnum) in Courses
Students( collegeId, first, last )
Emails( collegeId, email )
  collegeId refers to collegeId in Students
Enroll( student, dept, cnum, snum )
  student refers to collegeId in Students
  (dept, cnum, snum) refers to (dept, cnum, snum) in Sections
Converting the "Requires" Relationship (M : N)

Teachers( collegeld, first, last, office, email )
Courses( dept, cnum, title, hours )
Sections( dept, cnum, snum, room, time, teacher )
    teacher refers to collegeld in Teachers
    (dept, cnum) refers to (dept, cnum) in Courses
Students( collegeld, first, last )
Emails( collegeld, email )
    collegeld refers to collegeld in Students
Enroll( student, dept, cnum, snum )
    student refers to collegeld in Students
    (dept, cnum, snum) refers to (dept, cnum, snum) in Sections
Converting the "Requires" Relationship (M : N)

Teachers( collegeId, first, last, office, email )
Courses( dept, cnum, title, hours )
Sections( dept, cnum, snum, room, time, teacher )
    teacher refers to collegeId in Teachers
    (dept, cnum) refers to (dept, cnum) in Courses
Students( collegeId, first, last )
Emails( collegeId, email )
    collegeId refers to collegeId in Students
Enroll( student, dept, cnum, snum )
    student refers to collegeId in Students
    (dept, cnum, snum) refers to (dept, cnum, snum) in Sections
Requires( dept, cnum, prereqDept, prereqCnum )
Converting the "Requires" Relationship (M : N)

Teachers( collegeId, first, last, office, email )
Courses( dept, cnum, title, hours )
Sections( dept, cnum, snum, room, time, teacher )
  teacher refers to collegeId in Teachers
  (dept, cnum) refers to (dept, cnum) in Courses
Students( collegeId, first, last )
Emails( collegeId, email )
  collegeId refers to collegeId in Students
Enroll( student, dept, cnum, snum )
  student refers to collegeId in Students
  (dept, cnum, snum) refers to (dept, cnum, snum) in Sections
Requires( dept, cnum, prerreqDept, prerreqCnum )
  (dept, cnum) refers to (dept, cnum) in Courses
  (prerreqDept, prerreqCnum) refers to (dept, cnum) in Courses
Converting the "Completes" Relationship (M : N)

Teachers( collegeld, first, last, office, email )
Courses( dept, cnum, title, hours )
Sections( dept, cnum, snum, room, time, teacher )
  teacher refers to collegeld in Teachers
  (dept, cnum) refers to (dept, cnum) in Courses
Students( collegeld, first, last )
Emails( collegeld, email )
  collegeld refers to collegeld in Students
Enroll( student, dept, cnum, snum )
  student refers to collegeld in Students
  (dept, cnum, snum) refers to (dept, cnum, snum) in Sections
Requires( dept, cnum, prereqDept, prereqCnum )
  (dept, cnum) refers to (dept, cnum) in Courses
  (prereqDept, prereqCnum) refers to (dept, cnum) in Courses
Converting the "Completes" Relationship (M : N)

Teachers( collegeld, first, last, office, email )
Courses( dept, cnum, title, hours )
Sections( dept, cnum, snum, room, time, teacher )
  teacher refers to collegeld in Teachers
  (dept, cnum) refers to (dept, cnum) in Courses

Students( collegeld, first, last )
Emails( collegeld, email )
  collegeld refers to collegeld in Students

Enroll( student, dept, cnum, snum )
  student refers to collegeld in Students
  (dept, cnum, snum) refers to (dept, cnum, snum) in Sections

Requires( dept, cnum, prereqDept, prereqCnum )
  (dept, cnum) refers to (dept, cnum) in Courses
  (prereqDept, prereqCnum) refers to (dept, cnum) in Courses

Completes( student, dept, cnum, grade, term )
Converting the "Completes" Relationship (M : N)

Teachers( collegeld, first, last, office, email )
Courses( dept, cnum, title, hours )
Sections( dept, cnum, snum, room, time, teacher )
  teacher refers to collegeld in Teachers
  (dept, cnum) refers to (dept, cnum) in Courses
Students( collegeld, first, last )
Emails( collegeld, email )
collegeld refers to collegeld in Students
Enroll( student, dept, cnum, snum )
  student refers to collegeld in Students
  (dept, cnum, snum) refers to (dept, cnum, snum) in Sections
Requires( dept, cnum, prereqDept, prereqCnum )
  (dept, cnum) refers to (dept, cnum) in Courses
  (prereqDept, prereqCnum) refers to (dept, cnum) in Courses
Completes( student, dept, cnum, grade, term )
  student refers to collegeld in Students
  (dept, cnum) refers to (dept, cnum) in Courses
Conversion Complete

Teachers( collegeId, first, last, office, email )
Courses( dept, cnum, title, hours )
Sections( dept, cnum, snum, room, time, teacher )
   teacher refers to collegeId in Teachers
   (dept, cnum) refers to (dept, cnum) in Courses
Students( collegeId, first, last )
Emails( collegeId, email )
   collegeId refers to collegeId in Students
Enroll( student, dept, cnum, snum )
   student refers to collegeId in Students
   (dept, cnum, snum) refers to (dept, cnum, snum) in Sections
Requires( dept, cnum, prereqDept, prereqCnum )
   (dept, cnum) refers to (dept, cnum) in Courses
   (prereqDept, prereqCnum) refers to (dept, cnum) in Courses
Completes( student, dept, cnum, grade, term )
   student refers to collegeId in Students
   (dept, cnum) refers to (dept, cnum) in Courses
RSN to SQL CREATE TABLE Statements
The Three Relations to Convert

Teachers( collegeId, first, last, office, email )

Courses( dept, cnum, title, hours )

Sections( dept, cnum, snum, room, time, teacher )
  teacher refers to collegeID in Teachers
  (dept, cnum) refers to (dept, cnum) in Courses
### Teachers table

Teachers( collegeId, first, last, office, email )

Courses( dept, cnum, title, hours )

Sections( dept, cnum, snum, room, time, teacher )

- *teacher* refers to *collegeId* in Teachers
- (dept, cnum) refers to (dept, cnum) in Courses

```sql
CREATE TABLE Teachers (  
collegeID INTEGER PRIMARY KEY,  
first STRING, last STRING, office STRING, email STRING  
) ;
```
Courses table

Teachers( collegeId, first, last, office, email )
Courses( dept, cnum, title, hours )
Sections( dept, cnum, snum, room, time, teacher )
  teacher refers to collegeId in Teachers
  (dept, cnum) refers to (dept, cnum) in Courses

CREATE TABLE Teachers ( 
    collegeID INTEGER PRIMARY KEY, 
    first STRING, last STRING, office STRING, email STRING 
) ;

CREATE TABLE Courses ( 
    dept STRING, cnum INTEGER, 
    title STRING, hours INTEGER, 
    PRIMARY KEY ( dept, cnum ) 
) ;
Sections table

Teachers( collegeId, first, last, office, email )

Courses( dept, cnum, title, hours )

Sections( dept, cnum, snum, room, time, teacher )

teacher refers to collegeId in Teachers
(dept, cnum) refers to (dept, cnum) in Courses

CREATE TABLE Teachers (  
    collegeID INTEGER PRIMARY KEY,  
    first STRING, last STRING, office STRING, email STRING  
) ;

CREATE TABLE Courses (  
    dept STRING, cnum INTEGER,  
    title STRING, hours INTEGER,  
    PRIMARY KEY ( dept, cnum )  
) ;

CREATE TABLE Sections(  
    dept STRING, cnum INTEGER, snum INTEGER,  
    room STRING, time STRING,  
    teacher INTEGER REFERENCES Teachers( collegeID ),  
    PRIMARY KEY ( dept, cnum, snum ),  
    FOREIGN KEY ( dept, cnum ) REFERENCES Courses( dept, cnum )  
) ;
Final Creat Statements

Teachers( collegeId, first, last, office, email )
Courses( dept, cnum, title, hours )
Sections( dept, cnum, snum, room, time, teacher )
    teacher refers to collegeID in Teachers
    (dept, cnum) refers to (dept, cnum) in Courses

CREATE TABLE Teachers (  
    collegeID INTEGER PRIMARY KEY,  
    first STRING, last STRING, office STRING, email STRING  
) ;

CREATE TABLE Courses (  
    dept STRING, cnum INTEGER,  
    title STRING, hours INTEGER,  
    PRIMARY KEY ( dept, cnum )  
) ;

CREATE TABLE Sections (  
    dept STRING, cnum INTEGER, snum INTEGER,  
    room STRING, time STRING,  
    teacher INTEGER REFERENCES Teachers( collegeID ),  
    PRIMARY KEY ( dept, cnum, snum ),  
    FOREIGN KEY ( dept, cnum ) REFERENCES Courses( dept, cnum )  
) ;