

CS 425 – Database Organization

Fall 2023

Homework 1.5

Group Members:

Shriya Prasanna (A20521733)

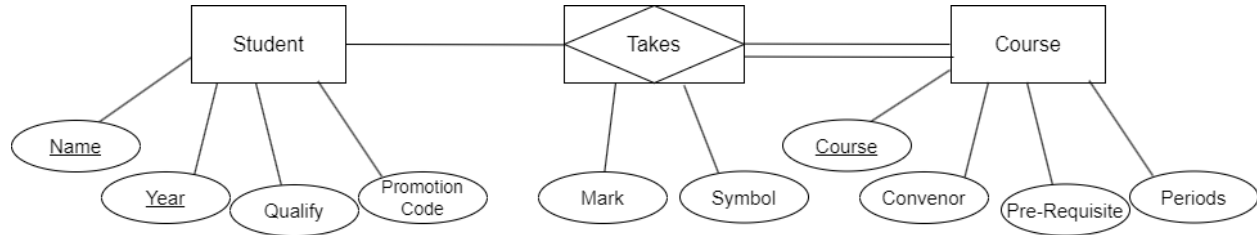
Girish Rajani-Bathija (A20503736)

Due Date: 10/24/23

Contributions:

Both members completed all questions together, compared/discussed answers, and then took 1 file as a submission.

Greendale Community College Chen ERD



Assumptions Made:

1. The primary key for Student consists of both Name and Year. This is because in the following year, the same student will have a different promotion code, so we need both the Name and Year to uniquely identify Student.
2. The primary key for Course consists of Course name.
3. A student cannot take the same course twice in that same year.

Modeling Decisions

When modeling the Chen ERD, after understanding the spreadsheet, an annual promotion code is recorded for each student. This means that this promotion code will change in the future year. That is why Year is also needed as a primary key for Student along with Name rather than just Name alone because in the following year, there will be a duplicate Name but with a different Year.

Relational Schema

Student (Name, Year, Qualify, Promotion Code)

Course (Course, Convenor, Pre-Requisites, Periods)

Student_Takes_Course (Name, Year, Course, Mark, Symbol)

How will the data be stored in the database?

Student Table:

Name	Year	Qualify	Promotion Code
------	------	---------	----------------

Bennett	2019	N	CON
---------	------	---	-----

Grey	2019	Y	QUA
------	------	---	-----

Kidd	2019	Y	CON
------	------	---	-----

Laurel	2019	N	CON
--------	------	---	-----

Course Table:

Course	Convenor	Pre-Requisites	Periods
--------	----------	----------------	---------

STA106	Cosby	1st or 2nd every Tue & Fri
--------	-------	----------------------------

AGE300	Rivers	AGE210 2nd Daily
--------	--------	------------------

BOT304	Blair	BOT202 1st Daily
--------	-------	------------------

AGE103	Bell	5th Mon to Wed
--------	------	----------------

Student_Takes_Course:

Name	Year	Course	Mark	Symbol
------	------	--------	------	--------

Bennett	2019	STA106	75	1
---------	------	--------	----	---

Grey	2019	AGE300	56	3
------	------	--------	----	---

Kidd	2019	BOT304	58	3
------	------	--------	----	---

Laurel	2019	AGE103	60	-2
--------	------	--------	----	----

Functional Dependency

1.

Course \rightarrow Convenor, Pre-Requisites, Periods

This above says that Convenor, Pre-Requisites, and Periods are functionally dependent on Course. This means that given a course, we can determine the Convenor, Pre-Requisites, and Periods. For example, Course 'STA220' determines the Convenor as 'Cosby', Pre-Requisites as 'MAM100 or STA106', and Periods as '1st Mon to Wed'.

2.

Name, Year, Course \rightarrow Mark, Symbol

This above says that Mark and Symbol are functionally dependent on Name, Year, Course. This means that given a Name, Year and Course, we can determine the Mark and Symbol. For example, the Name 'Bennett', Year '2019' and Course 'STA106' determines the mark '75' and symbol '1'.

1st Normal Form

Yes, the relation schema is in 1st normal form. There are no duplicate rows, each column only has one value for each row. Each table has a primary key for identification (Student – Name, Year, Course – Course, and Student_Takes_Course – Name, Year, Course), and lastly, a single cell does not hold more than 1 value which means it is atomic.

3rd Normal Form

In order to decide if the relation schema is in 3rd normal form, we need to first decide if its in 2nd normal form. This means there should be no partial dependencies. As shown in the previous dependency example, all non-key attributes are indeed dependent on the primary key so it is in 2NF.

For 3NF, we need to find potential transitive dependencies. A few possible transitive dependencies observed are Mark \rightarrow Symbol and Pre-Requisites \rightarrow Periods. However, both Mark and Pre-Requisite contain null values at some point and so cannot be considered transitive dependencies. Therefore the relation schema is in 3NF.