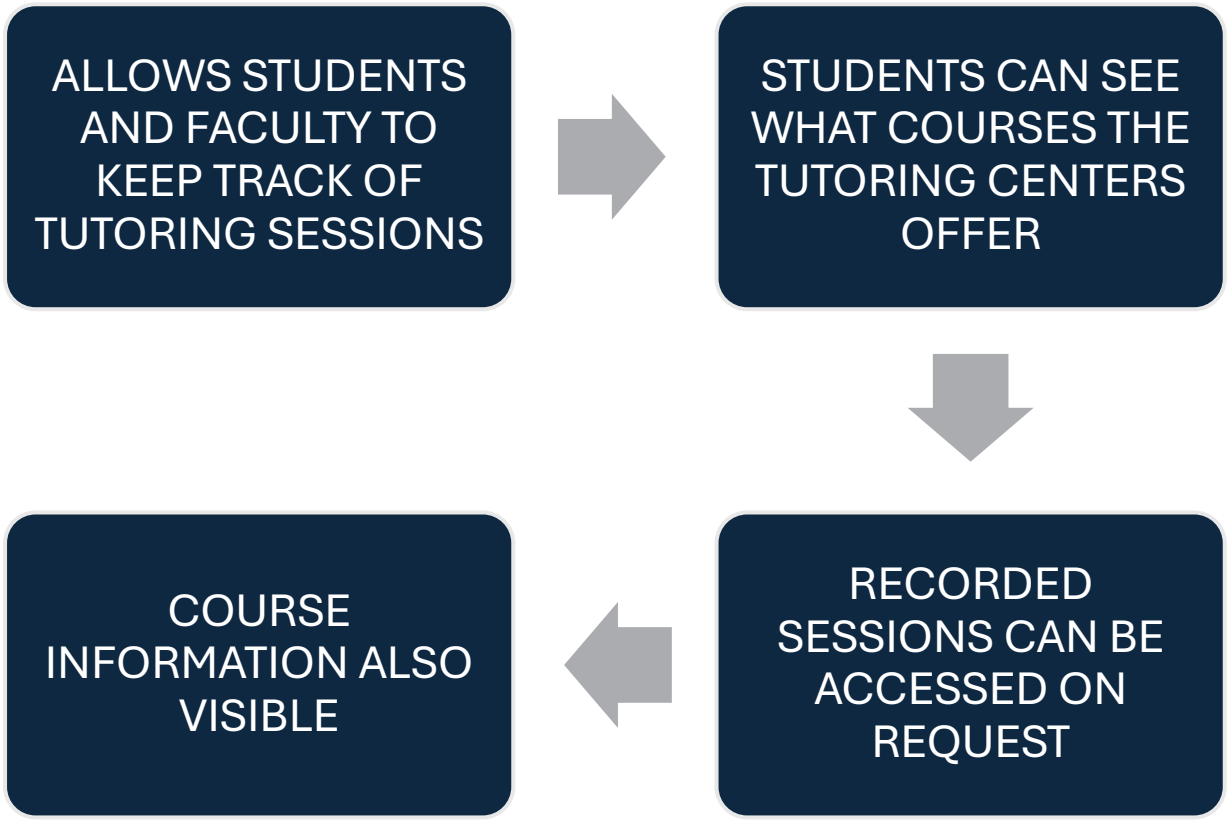
Tutoring Service Application

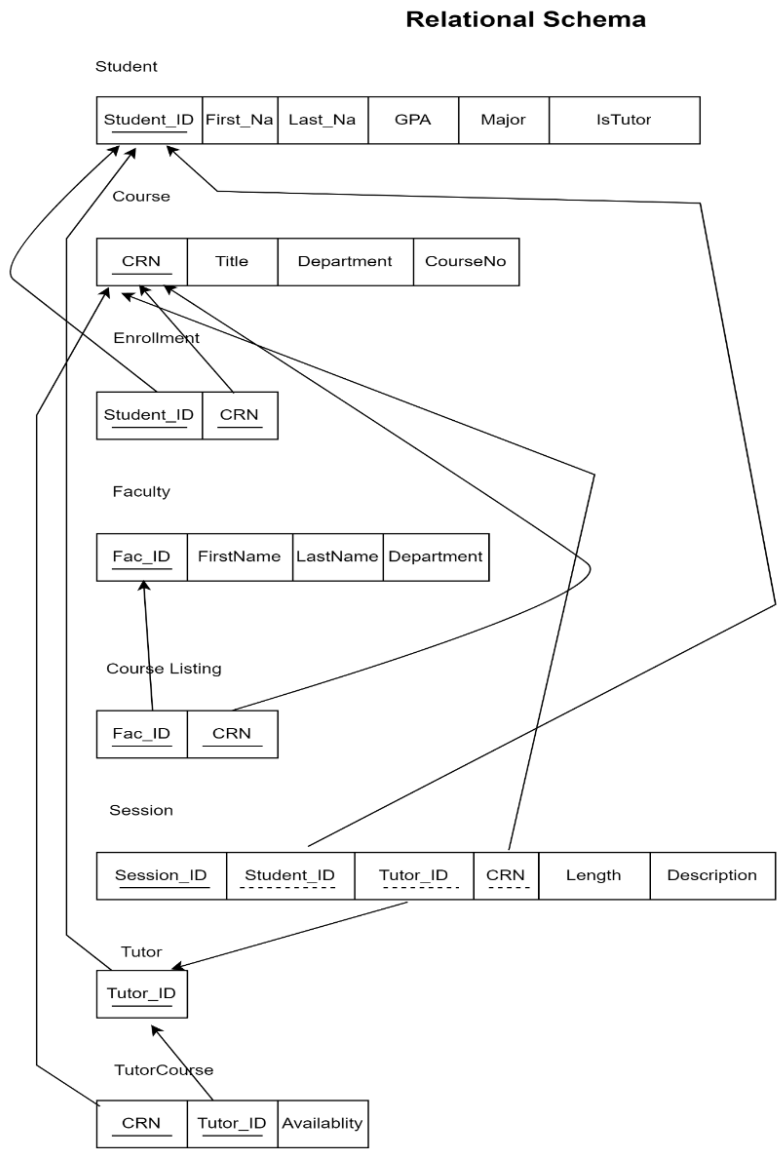
Chad Callender, Patrick Mitchell

May 4, 2023

Application Background

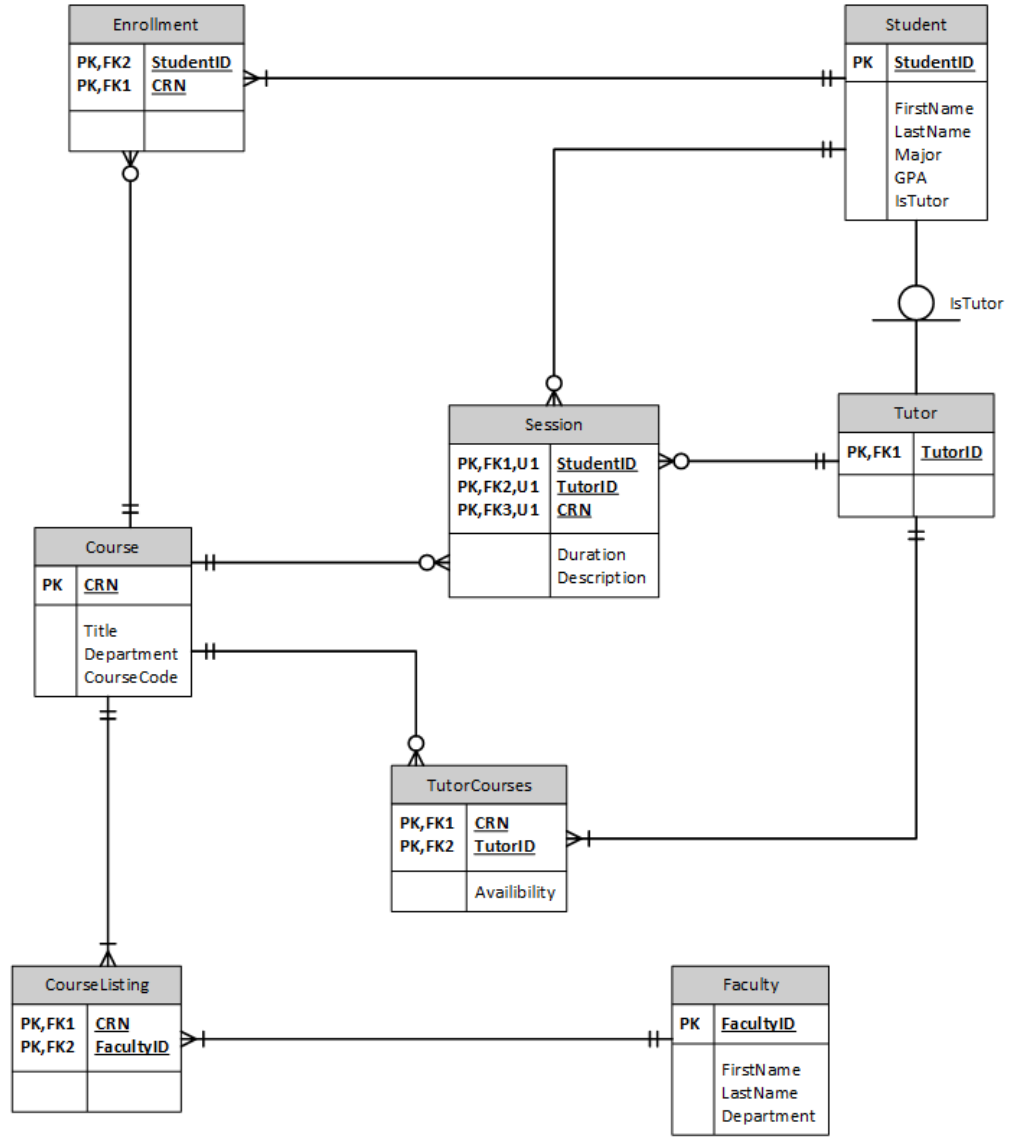


Logical Design



ERD

- Relationships
  - Student must be enrolled in at least one course
  - A tutor is a student; there may be other types
  - A tutor must offer tutoring in at least one course
  - A student may have multiple sessions with multiple tutors for multiple courses
  - A faculty member must teach at least one course



Before we get to it...

Honorable mention to the scripts that saved us time (They're the real MVPs here)

```
/*
c++ script to save time on wriiting insert statements

#include <iostream>
#include <fstream>

using namespace std;

int main()
{
    ifstream in;
    ofstream out;

    int CRN, FacultyID;

    in.open(nums.txt);
    out.open(finally.txt);

    while(in >> CRN, FacultyID)
    {
        out << "insert into courseListing_t (CRN, FacultyID) values (" << CRN << ", " << FacultyID << ")\;";
    }

    in.close();
    out.close();

    return 0;

}
```

```
python script to randomly associate data
import random

crn = [22664, 23142, 24100, 24352, 25287, 26765]

ids = [20270576, 20271293, 20280874]

tups = []

# num_studs = random.randint(1,len(ids))

for course in crn:
  num_studs = random.randint(1,len(ids))
  for i in range(num_studs+1):
    random.shuffle(ids)
    if ((course, ids[0])) not in tups:
      tups.append((course,ids[0]))

# print(tups)
df = open('tups.txt','w')
for tup in tups:
  df.write(f'{tup[0]} {tup[1]}\n')

df.close()
*/
```

Data Defintion

```
CREATE TABLE Student_t(
    StudentID INTEGER NOT NULL,
    FirstName VARCHAR(50) NOT NULL,
    LastName VARCHAR(50) NOT NULL,
    Major VARCHAR(23),
    Department VARCHAR(4),
    GPA DECIMAL(3,2) INVISIBLE,
    IsTutor VARCHAR(10) INVISIBLE,
CONSTRAINT PRIMARY KEY(StudentID));

CREATE TABLE Course_t(
    CRN INTEGER NOT NULL,
    Department VARCHAR(20) NOT NULL,
    CourseCode INTEGER NOT NULL,
    CourseTitle VARCHAR(50),
CONSTRAINT PRIMARY KEY(CRN));

CREATE TABLE Enrollment_t (
    CRN INTEGER NOT NULL,
    StudentID INTEGER NOT NULL,
 CONSTRAINT PRIMARY KEY(StudentID, CRN),
 CONSTRAINT FOREIGN KEY(StudentID) REFERENCES Student_t(StudentID),
CONSTRAINT FOREIGN KEY(CRN) REFERENCES Course_t(CRN));

CREATE TABLE Faculty_t (
    FacultyID INTEGER NOT NULL,
    FirstName VARCHAR(20) NOT NULL,
    LastName VARCHAR(20) NOT NULL,
    Department VARCHAR(4) NOT NULL,
CONSTRAINT PRIMARY KEY(FacultyID));

CREATE TABLE CourseListing_t (
    CRN INTEGER NOT NULL,
    FacultyID INTEGER NOT NULL,
 CONSTRAINT PRIMARY KEY(FacultyID, CRN),
 CONSTRAINT FOREIGN KEY(FacultyID) REFERENCES Faculty_t(FacultyID),
CONSTRAINT FOREIGN KEY(CRN) REFERENCES Course_t(CRN));
```

```
CREATE TABLE Session_t (
    SessionID INTEGER NOT NULL AUTO_INCREMENT,
    StudentID INTEGER NOT NULL,
    TutorID INTEGER NOT NULL,
    CRN INTEGER NOT NULL,
    Date DATE,
    Duration INTEGER CHECK (Duration >= 5),
    Description VARCHAR(50),
CONSTRAINT PRIMARY KEY(SessionID),
CONSTRAINT Session UNIQUE (StudentID, TutorID, CRN, Date),
CONSTRAINT FOREIGN KEY(StudentID) REFERENCES Student_t(StudentID),
CONSTRAINT FOREIGN KEY(TutorID) REFERENCES Student_t(StudentID),
CONSTRAINT FOREIGN KEY(CRN) REFERENCES Course_t(CRN));

CREATE TABLE TutorCourses_t (
    CRN INTEGER NOT NULL,
    TutorID INTEGER NOT NULL,
    Availability VARCHAR(20),
CONSTRAINT PRIMARY KEY(CRN, tutorID),
CONSTRAINT FOREIGN KEY(CRN) REFERENCES Course_t(CRN),
CONSTRAINT FOREIGN KEY(TutorID) REFERENCES student_t(StudentID));

-- TUTOR VIEW
CREATE VIEW tutor_v AS (
    SELECT studentID AS 'tutorID'
    FROM student_t
    WHERE isTutor = 'true');
```

Data Defintion

```
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    Department VARCHAR(4),
    GPA DECIMAL(3,2) INVISIBLE,
    IsTutor VARCHAR(10) INVISIBLE,
CONSTRAINT PRIMARY KEY(StudentID));

CREATE TABLE
    CRN INTEG
    Departmen
    CourseCod
    CourseTit
CONSTRAINT PRIMARY KEY(CRN));

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 CONSTRAINT FOREIGN KEY(StudentID) REFERENCES Student_t(StudentID),
CONSTRAINT FOREIGN KEY(CRN) REFERENCES Course_t(CRN));

CREATE TABLE Faculty_t (
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    FirstName VARCHAR(20) NOT NULL,
    LastName VARCHAR(20) NOT NULL,
    Department VARCHAR(4) NOT NULL,
CONSTRAINT PRIMARY KEY(FacultyID));

CREATE TABLE CourseListing_t (
    CRN INTEGER NOT NULL,
    FacultyID INTEGER NOT NULL,
 CONSTRAINT PRIMARY KEY(FacultyID, CRN),
 CONSTRAINT FOREIGN KEY(FacultyID) REFERENCES Faculty_t(FacultyID),
CONSTRAINT FOREIGN KEY(CRN) REFERENCES Course_t(CRN));
```

```
GPA DECIMAL(3,2) INVISIBLE,
IsTutor VARCHAR(10) INVISIBLE,
```

```
CREATE TABLE Session_t (
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    Date DATE,
    Duration INTEGER CHECK (Duration >= 5),
    Description VARCHAR(50),
CONSTRAINT PRIMARY KEY(SessionID),
CONSTRAINT Session UNIQUE (StudentID, TutorID, CRN, Date),
CONSTRAINT FOREIGN KEY(StudentID) REFERENCES Student_t(StudentID),
CONSTRAINT FOREIGN KEY(TutorID) REFERENCES Student_t(StudentID),
CONSTRAINT FOREIGN KEY(CRN) REFERENCES Course_t(CRN));

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CONSTRAINT PRIMARY KEY(CRN));

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    Date DATE,
    Duration INTEG
    Description VA
CONSTRAINT PRIMARY
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 CONSTRAINT FOREIGN KEY(FacultyID) REFERENCES Faculty_t(FacultyID),
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```
Date DATE,
Duration INTEGER CHECK (Duration >= 5),
```

```
CREATE TABLE Session_t (
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    CourseTitle VARCHAR
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    Department VARCHAR(20) NOT NULL,
    CourseCode INTEGER NOT NULL,
    CourseTitle VARCHAR(50)
CONSTRAINT PRIMARY KEY(

CREATE TABLE Enrollment
    CRN INTEGER NOT NUL
    StudentID INTEGER N
 CONSTRAINT PRIMARY KEY(
 CONSTRAINT FOREIGN KEY(
CONSTRAINT FOREIGN KEY(

CREATE TABLE Faculty_t
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    FirstName VARCHAR(2
    LastName VARCHAR(20) NOT NULL,
    Department VARCHAR(4) NOT NULL,
CONSTRAINT PRIMARY KEY(FacultyID));

CREATE TABLE CourseListing_t (
    CRN INTEGER NOT NULL,
    FacultyID INTEGER NOT NULL,
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    TutorID INTEGER NOT NULL,
    CRN INTEGER NOT NULL,
    Date DATE,
    Duration INTEGER CHECK (Duration >= 5),
    Description VARCHAR(50),
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CONSTRAINT FOREIGN KEY(StudentID) REFERENCES Student_t(StudentID),
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torID INTEGER NOT NULL,
ailability VARCHAR(20),
AINT PRIMARY KEY(CRN, tutorID),
AINT FOREIGN KEY(CRN) REFERENCES Course_t(CRN),
AINT FOREIGN KEY(TutorID) REFERENCES student_t(StudentID));

-- TUTOR VIEW
CREATE VIEW tutor_v AS (
    SELECT studentID AS 'tutorID'
    FROM student_t
    WHERE isTutor = 'true');
```

Tables and Views

```
+-----------+-----------+------------+------------------------+------------+
| StudentID | FirstName | LastName   | Major                  | Department |
+-----------+-----------+------------+------------------------+------------+
|  20206275 | Guthrie   | Dargan     | Business Administration | BUAD       |
|  20208477 | Fan       | Smallcombe | Biology                | BIOL       |
|  20209667 | Jackelyn  | Craigg     | Business Administration | BUAD       |
|  20215007 | Oona      | Laxen      | Business Administration | BUAD       |
|  20218294 | Jolyn     | Zieme      | Political Science      | POLS       |
|  20224532 | Babb      | Wylder     | Biology                | BIOL       |
|  20225509 | Tamiko    | Lewing     | Computer Science       | CMPS       |
|  20227594 | Gregorius | Trask      | Mechanical Engineering | MENG       |
|  20228794 | Rriocard  | Titley     | Computer Science       | CMPS       |
|  20230527 | Teodorico | Cranch     | Business Administration | BUAD       |
+-----------+-----------+------------+------------------------+------------+
10 rows in set (0.00 sec)

mysql> select * from course_t limit 5;
+-------+------------+------------+-------------------------------+
| CRN   | Department | CourseCode | CourseTitle                   |
+-------+------------+------------+-------------------------------+
| 20169 | NURS       |       1143 | Introduction to Nursing       |
| 22664 | ENGL       |       1143 | Intro Crit Read & Acad Writing |
| 23011 | MATH       |       1243 | Plane Trigonometry            |
| 23142 | ENGL       |       1143 | Intro Crit Read & Acad Writing |
| 23503 | NURS       |       2284 | Mother and Baby               |
+-------+------------+------------+-------------------------------+
5 rows in set (0.00 sec)
```

Student_t, course_t

```
mysql> select * from faculty_t limit 5;
+-----------+-----------+------------+------------+
| FacultyID | FirstName | LastName   | Department |
+-----------+-----------+------------+------------+
|  20005093 | Karil     | Millthorpe | MATH       |
|  20023140 | Evanne    | Iles       | NURS       |
|  20027880 | Imogene   | Le Fleming | CMPS       |
|  20028804 | Ashely    | McIlmorie  | BIOL       |
|  20039236 | Brig      | Benion     | MENG       |
+-----------+-----------+------------+------------+
5 rows in set (0.00 sec)

mysql> select * from tutor_t limit 5;
ERROR 1146 (42S02): Table 'tutoring.tutor_t' doesn't exist
mysql> select * from tutor_v limit 5;
+----------+
| tutorID  |
+----------+
| 20208477 |
| 20215007 |
| 20230527 |
| 20230929 |
| 20232283 |
+----------+
5 rows in set (0.00 sec)
```

Faculty_t, tutor_v

```
mysql> select count(*) from enrollment_t;
+----------+
| count(*) |
+----------+
|      202 |
+----------+
1 row in set (0.01 sec)

mysql> select count(*) from session_t;
+----------+
| count(*) |
+----------+
|      275 |
+----------+
1 row in set (0.00 sec)
```

Enrollment_t, session_t counts

Data Manipulation (SQL Queries)

Students enrolled in Calculus I by course title and course code

```sql
-- 1a. Students enrolled in a particular course code:

SELECT s.studentID, FirstName, LastName
FROM student_t s, enrollment_t e, course_t c
wHERE e.crn = c.crn AND e.studentid = s.studentid
AND c.coursecode = 2214;

-- 1b. Students enrolled in a particular coursetitle:

SELECT s.studentID, FirstName, LastName
FROM student_t s, enrollment_t e, course_t c
wHERE e.crn = c.crn AND e.studentid = s.studentid
AND c.coursetitle = 'Calculus I';
```

```
mysql> -- 1a. Students enrolled in a particular course code:
mysql>
mysql> SELECT s.studentID, FirstName, LastName
    -> FROM student_t s, enrollment_t e, course_t c
    -> wHERE e.crn = c.crn AND e.studentid = s.studentid
    -> AND c.coursecode = 2214;
+-----------+-----------+--------------+
| studentID | FirstName | LastName     |
+-----------+-----------+--------------+
|  20225509 | Tamiko    | Lewing       |
|  20228794 | Rriocard  | Titley       |
|  20270195 | Ladonna   | Shyre        |
|  20279328 | Pearce    | Maggorini    |
|  20280052 | Milly     | Basini-Gazzi |
|  20299748 | Aile      | Carey        |
+-----------+-----------+--------------+
6 rows in set (0.00 sec)

mysql>
mysql> -- 1b. Students enrolled in a particular coursetitle:
mysql>
mysql> SELECT s.studentID, FirstName, LastName
    -> FROM student_t s, enrollment_t e, course_t c
    -> wHERE e.crn = c.crn AND e.studentid = s.studentid
    -> AND c.coursetitle = 'Calculus I';
+-----------+-----------+--------------+
| studentID | FirstName | LastName     |
+-----------+-----------+--------------+
|  20225509 | Tamiko    | Lewing       |
|  20228794 | Rriocard  | Titley       |
|  20270195 | Ladonna   | Shyre        |
|  20279328 | Pearce    | Maggorini    |
|  20280052 | Milly     | Basini-Gazzi |
|  20299748 | Aile      | Carey        |
+-----------+-----------+--------------+
6 rows in set (0.00 sec)
```

Courses with no students enrolled

```sql
-- 2. Courses that have no enrollment:

SELECT crn, coursecode, coursetitle
FROM course_t
WHERE crn NOT IN
(SELECT distinct crn FROM enrollment_t);
```

```
mysql> SELECT crn, coursecode, coursetitle
    -> FROM course_t
    -> WHERE crn NOT IN
    -> (SELECT distinct crn FROM enrollment_t);
+-------+------------+--------------------------------+
| crn   | coursecode | coursetitle                    |
+-------+------------+--------------------------------+
| 23011 |       1243 | Plane Trigonometry             |
| 25514 |       3313 | Physical Chemistry             |
| 26660 |       3313 | Intro Read & Writ - Literature |
| 29494 |       2563 | Fluid Dynamics                 |
+-------+------------+--------------------------------+
4 rows in set (0.00 sec)
```

Tutor courses with students enrolled

```sql
-- 5. Courses offered at the tutoring center that have students enrolled
SELECT c.crn, tutorID, firstName Tutor, courseTitle
FROM student_t s, tutorcourses_t tc, course_t c
WHERE studentID = tutorID
    AND tc.crn = c.crn
    AND courseTitle NOT IN (select courseTitle from course_t where crn not in (select crn from enrollment_t))
ORDER BY courseTitle;
```

```
mysql> SELECT c.crn, tutorID, firstName Tutor, courseTitle
    -> FROM student_t s, tutorcourses_t tc, course_t c
    -> WHERE studentID = tutorID
    -> AND tc.crn = c.crn
    -> AND courseTitle NOT IN (select courseTitle from course_t where
    -> ORDER BY courseTitle;
+-------+----------+-----------+---------------------------------+
| crn   | tutorID  | Tutor     | courseTitle                     |
+-------+----------+-----------+---------------------------------+
| 26567 | 20264548 | Emmalynne | Calculus I                      |
| 26567 | 20293929 | Chaim     | Calculus I                      |
| 26567 | 20299748 | Aile      | Calculus I                      |
| 25313 | 20272587 | Adi       | Calculus II                     |
| 24077 | 20208477 | Fan       | Cells II                        |
| 24077 | 20264548 | Emmalynne | Cells II                        |
| 25287 | 20264548 | Emmalynne | College Algebra                 |
| 25287 | 20272587 | Adi       | College Algebra                 |
| 25287 | 20293929 | Chaim     | College Algebra                 |
| 28816 | 20299748 | Aile      | Computer Science I              |
| 26765 | 20215007 | Oona      | Foundations of Business         |
| 26765 | 20230527 | Teodorico | Foundations of Business         |
| 26986 | 20208477 | Fan       | General Chemistry I             |
| 26986 | 20293929 | Chaim     | General Chemistry I             |
| 23142 | 20208477 | Fan       | Intro Crit Read & Acad Writing  |
| 23142 | 20215007 | Oona      | Intro Crit Read & Acad Writing  |
| 23890 | 20272587 | Adi       | Intro to Mechanical Engineering |
| 23890 | 20293929 | Chaim     | Intro to Mechanical Engineering |
| 20169 | 20232283 | Horatio   | Introduction to Nursing         |
| 20169 | 20258701 | Wanids    | Introduction to Nursing         |
| 24370 | 20298247 | Charmion  | Introduction to Nursing         |
+-------+----------+-----------+---------------------------------+
21 rows in set (0.00 sec)
```

Number of sessions by department

```sql
-- 4. Metrics for sessions by department
SELECT department, COUNT(department) 'Number of Sessions' ,
    SUM(s.duration) 'Duration in Minutes',
    SUM(duration) / COUNT(department) 'Average Session Length'
FROM session_t s INNER JOIN course_t c ON s.crn = c.crn
GROUP BY department
ORDER BY SUM(duration) desc;
```

```
mysql> SELECT department, COUNT(department) 'Number of Sessions' , SUM(s.duration) '
    -> FROM session_t s INNER JOIN course_t c ON s.crn = c.crn
    -> GROUP BY department
    -> ORDER BY SUM(duration) desc;
+------------+--------------------+--------------------+-----------------------+
| department | Number of Sessions | Duration in Minutes | Average Session Length |
+------------+--------------------+--------------------+-----------------------+
| MATH       |                122 |               4173 |               34.2049 |
| CHEM       |                 45 |               1675 |               37.2222 |
| ENGL       |                 38 |               1335 |               35.1316 |
| BUAD       |                 30 |               1058 |               35.2667 |
| NURS       |                 23 |                766 |               33.3043 |
| CMPS       |                 17 |                467 |               27.4706 |
+------------+--------------------+--------------------+-----------------------+
6 rows in set (0.00 sec)
```

Total time students spent in tutoring for a particular course

```sql
-- 3. The total time spent in tutor session for a particular course

SELECT studentid, SUM(duration) 'Session Length in minutes'
FROM session_t
WHERE crn IN (select crn from course_t where courseTitle = 'Computer Science I')
group by studentid;
```

```
mysql> SELECT studentid, SUM(duration) 'Session Length in minutes'
    -> FROM session_t
    -> WHERE crn IN (select crn from course_t where courseTitle = 'Computer Science I')
    -> group by studentid;
+-----------+---------------------------+
| studentid | Session Length in minutes |
+-----------+---------------------------+
|  20244742 |                       123 |
|  20246928 |                       167 |
|  20270576 |                        40 |
|  20259851 |                         6 |
|  20270195 |                       131 |
+-----------+---------------------------+
5 rows in set (0.00 sec)
```