

# **DBMS Group Assignment 1**



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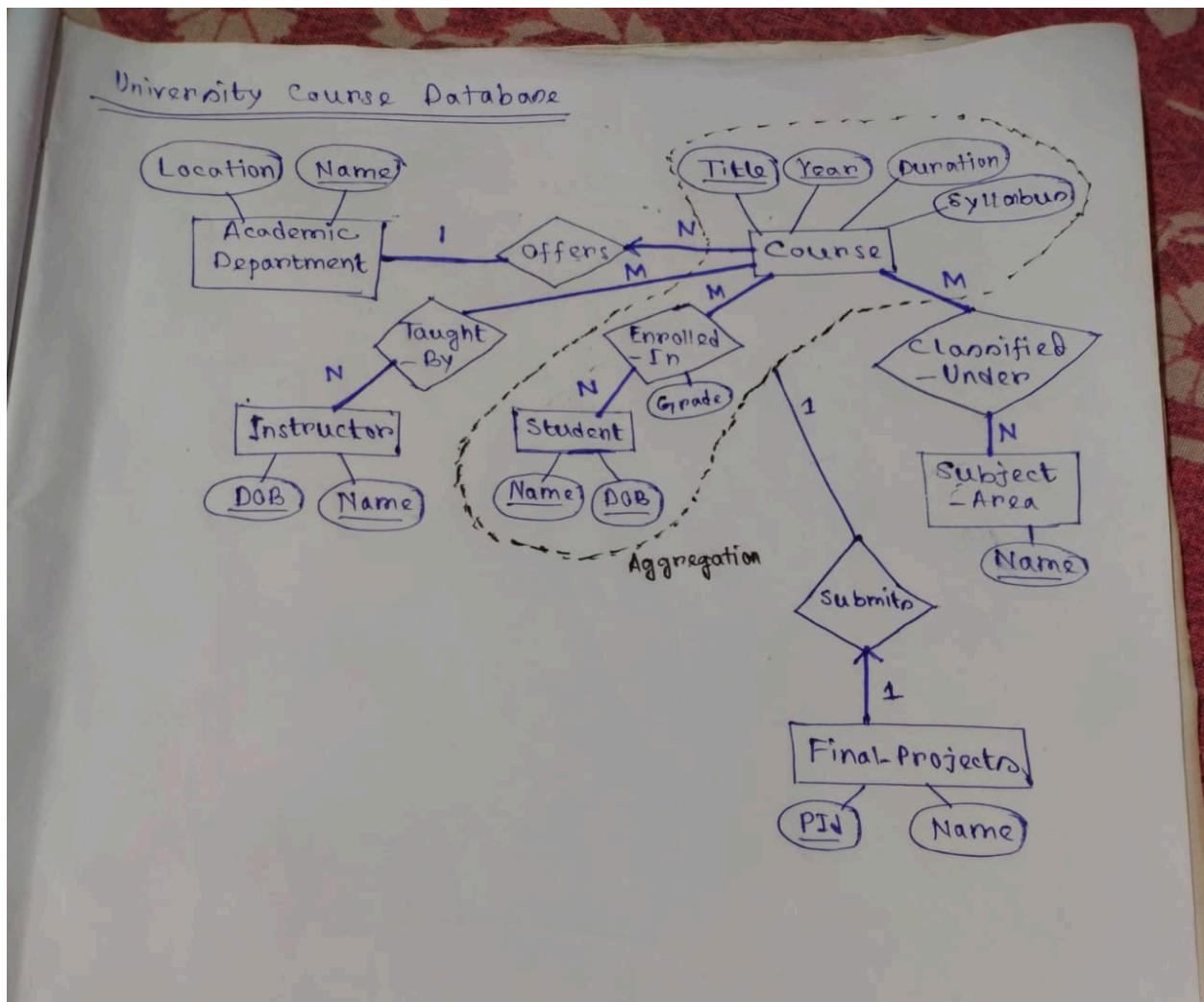
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# Problem #1: University Course Database

## E-R Diagram

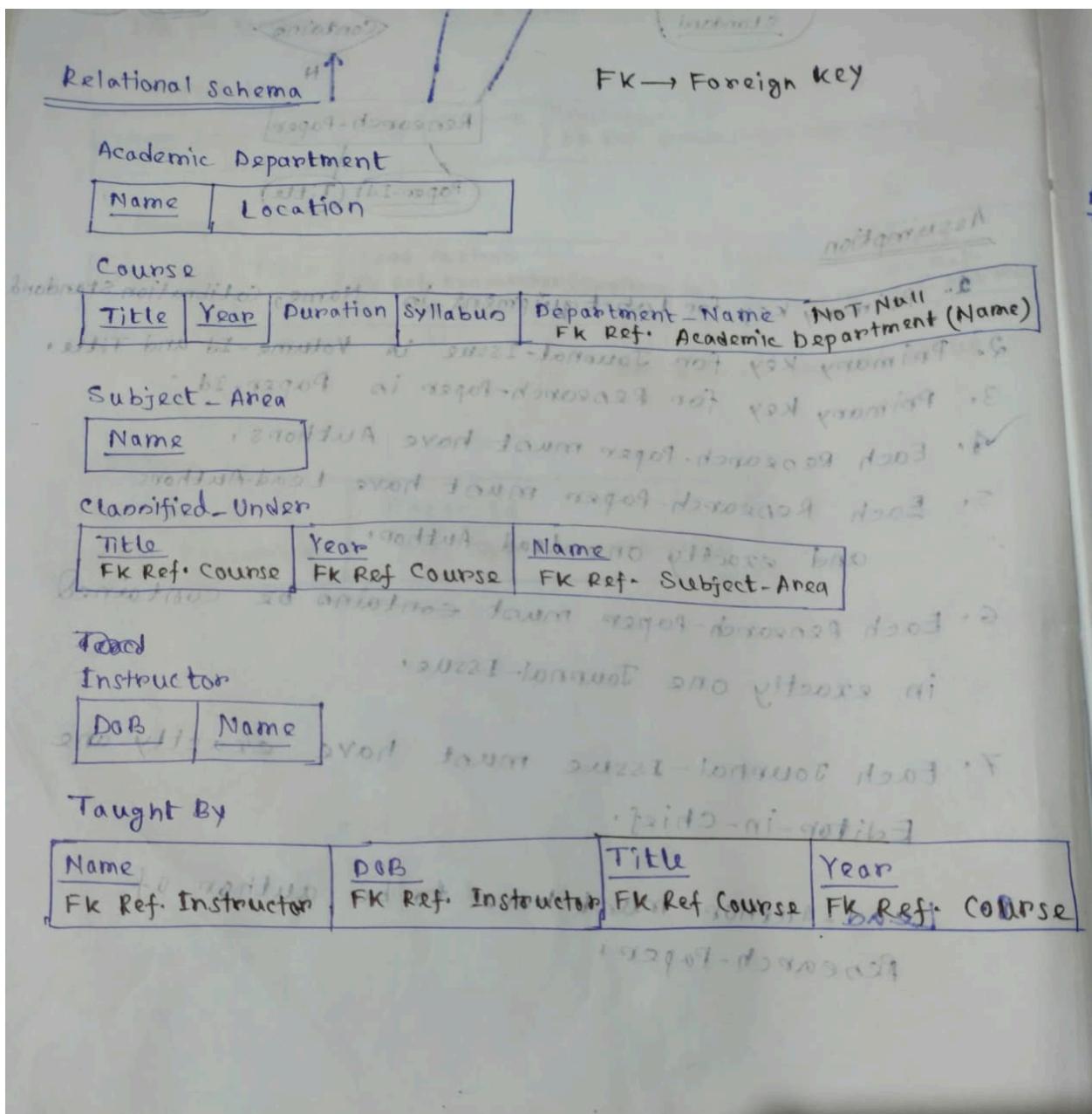


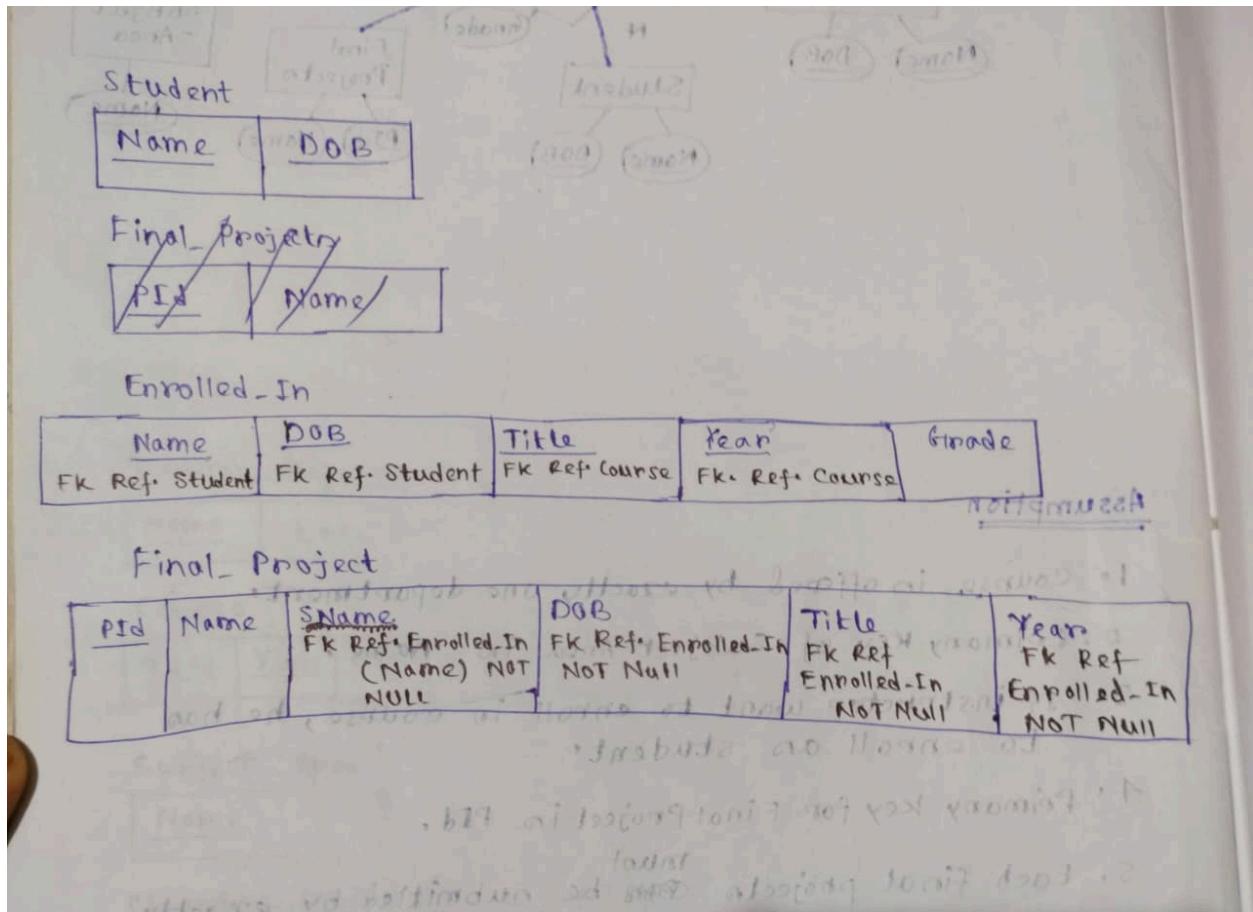
## Assumptions

### Assumption

1. Course is offered by exactly one department.
2. Primary key of Subject Area is Name.
3. If instructor want to enroll in course, he has to enroll as student.
4. Primary key for Final Project is PID.
5. Each final project must be submitted by exactly one student from exactly one course.
6. Enrolled-In relationship aggregates as entity.
7. A student enrolled-in a particular course submits zero or one final projects.

# Relational Schema





# Sql Script

```
-- Academic_Department Table
CREATE TABLE Academic_Department (
    Name VARCHAR(50) PRIMARY KEY,
    Location VARCHAR(100)
);

INSERT INTO Academic_Department VALUES
('Physics', 'Bldg A'),
('Chemistry', 'Bldg B'),
('Mathematics', 'Bldg C'),
('Biology', 'Bldg D'),
('Computer Science', 'Bldg E'),
('Mechanical Eng', 'Bldg F'),
('Electrical Eng', 'Bldg G'),
('Civil Eng', 'Bldg H'),
('Economics', 'Bldg I'),
('Psychology', 'Bldg J'),
('History', 'Bldg K'),
('Philosophy', 'Bldg L');

-- Course Table
CREATE TABLE Course (
    Title VARCHAR(50),
    Year INT,
    Duration INT,
    Syllabus TEXT,
    Department_Name VARCHAR(50) NOT NULL,
    PRIMARY KEY (Title, Year),
    FOREIGN KEY (Department_Name) REFERENCES Academic_Department(Name)
);
INSERT INTO Course VALUES
('Quantum Mechanics', 2022, 1, 'Wave functions, uncertainty, operators',
'Physics'),
('Organic Chemistry', 2022, 1, 'Hydrocarbons, reactions, spectroscopy',
'Chemistry'),
```

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('Calculus I', 2022, 1, 'Limits, derivatives, integrals', 'Mathematics'),
('Cell Biology', 2022, 1, 'Cell structure, function, genetics',
'Biology'),
('Data Structures', 2022, 1, 'Arrays, lists, trees, graphs', 'Computer
Science'),
('Thermodynamics', 2022, 1, 'Heat, energy, entropy, cycles', 'Mechanical
Eng'),
('Circuits', 2022, 1, 'Resistors, capacitors, inductors', 'Electrical
Eng'),
('Structural Analysis', 2022, 1, 'Beams, frames, load analysis', 'Civil
Eng'),
('Microeconomics', 2022, 1, 'Supply, demand, markets', 'Economics'),
('Social Psychology', 2022, 1, 'Group dynamics, attitudes, behavior',
'Psychology'),
('World History', 2022, 1, 'Civilizations, revolutions, cultures',
'History'),
('Logic', 2022, 1, 'Propositions, arguments, proofs', 'Philosophy');

-- Subject_Area Table
CREATE TABLE Subject_Area (
    Name VARCHAR(50) PRIMARY KEY
);

INSERT INTO Subject_Area VALUES
('Quantum Physics'),
('Organic Chemistry'),
('Differential Calculus'),
('Cellular Biology'),
('Algorithms'),
('Heat Engines'),
('Electronic Systems'),
('Structural Engineering'),
('Market Theory'),
('Behavioral Science'),
('Ancient Civilizations'),
('Formal Logic');

-- Classified_Under Table
CREATE TABLE Classified_Under (
    Title VARCHAR(50),
    Subject_Area_Name VARCHAR(50),
    Description TEXT,
    Year INT,
    Rating DECIMAL(3,2),
    Is_Deleted BOOLEAN
);
```

```

Year INT,
Name VARCHAR(50),
PRIMARY KEY (Title, Year, Name),
FOREIGN KEY (Title, Year) REFERENCES Course(Title, Year),
FOREIGN KEY (Name) REFERENCES Subject_Area(Name)
);

INSERT INTO Classified_Under VALUES
('Quantum Mechanics', 2022, 'Quantum Physics'),
('Organic Chemistry', 2022, 'Organic Chemistry'),
('Calculus I', 2022, 'Differential Calculus'),
('Cell Biology', 2022, 'Cellular Biology'),
('Data Structures', 2022, 'Algorithms'),
('Thermodynamics', 2022, 'Heat Engines'),
('Circuits', 2022, 'Electronic Systems'),
('Structural Analysis', 2022, 'Structural Engineering'),
('Microeconomics', 2022, 'Market Theory'),
('Social Psychology', 2022, 'Behavioral Science'),
('World History', 2022, 'Ancient Civilizations'),
('Logic', 2022, 'Formal Logic');

-- Instructor Table
CREATE TABLE Instructor (
    DOB DATE,
    Name VARCHAR(50),
    PRIMARY KEY (DOB, Name)
);

INSERT INTO Instructor VALUES
('1975-03-15', 'Mohan Gupta'),
('1980-04-26', 'Priya Sharma'),
('1983-07-11', 'Rahul Bose'),
('1978-12-03', 'Anjali Sinha'),
('1985-09-19', 'Nitin Saxena'),
('1972-08-02', 'Seema Nair'),
('1986-06-17', 'Aashish Roy'),
('1974-10-28', 'Poonam Verma'),
('1979-11-12', 'Omprakash Mishra'),
('1982-05-06', 'Sneha Sen'),
('1977-02-01', 'Suresh Chavan'),

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('1981-12-20', 'Kavita Rao');

-- Taught_By Table
CREATE TABLE Taught_By (
    Name VARCHAR(50),
    DOB DATE,
    Title VARCHAR(50),
    Year INT,
    PRIMARY KEY (Name, DOB, Title, Year),
    FOREIGN KEY (DOB, Name) REFERENCES Instructor(DOB, Name),
    FOREIGN KEY (Title, Year) REFERENCES Course(Title, Year)
);

INSERT INTO Taught_By VALUES
('Mohan Gupta', '1975-03-15', 'Quantum Mechanics', 2022),
('Priya Sharma', '1980-04-26', 'Organic Chemistry', 2022),
('Rahul Bose', '1983-07-11', 'Calculus I', 2022),
('Anjali Sinha', '1978-12-03', 'Cell Biology', 2022),
('Nitin Saxena', '1985-09-19', 'Data Structures', 2022),
('Seema Nair', '1972-08-02', 'Thermodynamics', 2022),
('Aashish Roy', '1986-06-17', 'Circuits', 2022),
('Poonam Verma', '1974-10-28', 'Structural Analysis', 2022),
('Omprakash Mishra', '1979-11-12', 'Microeconomics', 2022),
('Sneha Sen', '1982-05-06', 'Social Psychology', 2022),
('Suresh Chavan', '1977-02-01', 'World History', 2022),
('Kavita Rao', '1981-12-20', 'Logic', 2022);

-- Student Table
CREATE TABLE Student (
    Name VARCHAR(50),
    DOB DATE,
    PRIMARY KEY (Name, DOB)
);

INSERT INTO Student VALUES
('Ankit Jain', '2002-07-21'),
('Sneha Roy', '2001-09-30'),
('Harsh Gupta', '2002-01-12'),
('Riya Singh', '2001-11-05'),
('Arjun Mishra', '2002-04-19'),

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('Kriti Sharma', '2001-08-22'),
('Naveen Kumar', '2002-05-31'),
('Tanya Paul', '2002-02-17'),
('Deepak Yadav', '2001-12-02'),
('Shikha Pathak', '2002-03-13'),
('Manav Joshi', '2001-06-11'),
('Isha Malhotra', '2002-09-10');

-- Enrolled_In Table
CREATE TABLE Enrolled_In (
    Name VARCHAR(50),
    DOB DATE,
    Title VARCHAR(50),
    Year INT,
    Grade CHAR(2),
    PRIMARY KEY (Name, DOB, Title, Year),
    FOREIGN KEY (Name, DOB) REFERENCES Student(Name, DOB),
    FOREIGN KEY (Title, Year) REFERENCES Course(Title, Year)
);

INSERT INTO Enrolled_In VALUES
('Ankit Jain', '2002-07-21', 'Quantum Mechanics', 2022, 'A'),
('Sneha Roy', '2001-09-30', 'Organic Chemistry', 2022, 'A'),
('Harsh Gupta', '2002-01-12', 'Calculus I', 2022, 'B'),
('Riya Singh', '2001-11-05', 'Cell Biology', 2022, 'A'),
('Arjun Mishra', '2002-04-19', 'Data Structures', 2022, 'A'),
('Kriti Sharma', '2001-08-22', 'Thermodynamics', 2022, 'B'),
('Naveen Kumar', '2002-05-31', 'Circuits', 2022, 'B'),
('Tanya Paul', '2002-02-17', 'Structural Analysis', 2022, 'A'),
('Deepak Yadav', '2001-12-02', 'Microeconomics', 2022, 'B'),
('Shikha Pathak', '2002-03-13', 'Social Psychology', 2022, 'A'),
('Manav Joshi', '2001-06-11', 'World History', 2022, 'B'),
('Isha Malhotra', '2002-09-10', 'Logic', 2022, 'A');

-- Final_Project_Student Table
CREATE TABLE Final_Project (
    PId VARCHAR(10) PRIMARY KEY,
    Name VARCHAR(50),
    SName VARCHAR(50) NOT NULL,

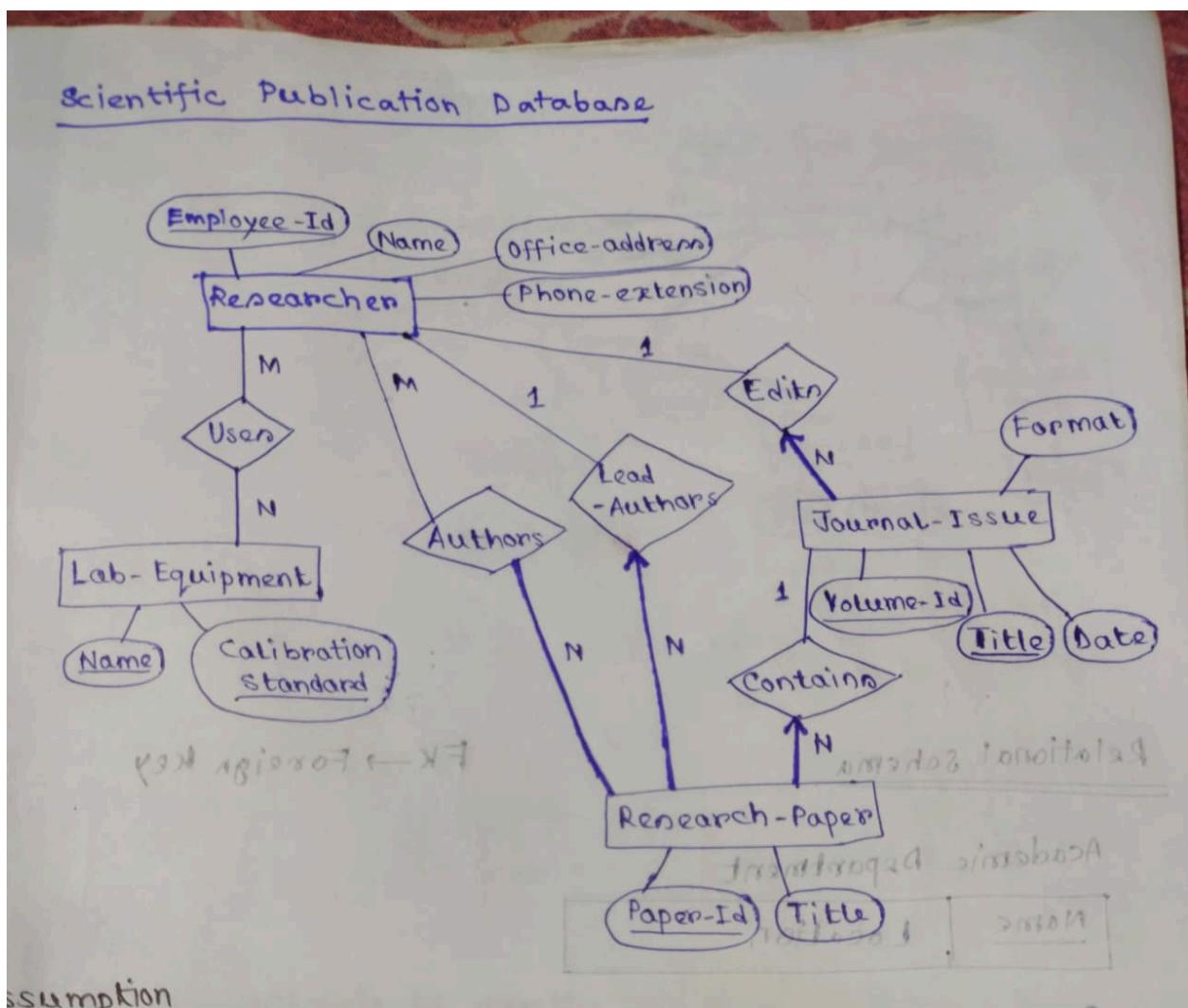
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DOB DATE NOT NULL,
Title VARCHAR(50) NOT NULL,
Year INT NOT NULL,
FOREIGN KEY (SName,DOB,Title, Year) REFERENCES
Enrolled_In(Name,DOB,Title, Year)
);

INSERT INTO Final_Project VALUES
('FP001', 'Quantum Simulation', 'Ankit Jain', '2002-07-21', 'Quantum
Mechanics', 2022),
('FP002', 'Organic Synthesis Lab', 'Sneha Roy', '2001-09-30', 'Organic
Chemistry', 2022),
('FP003', 'Calculus Modeling', 'Harsh Gupta', '2002-01-12', 'Calculus I',
2022),
('FP004', 'Cell Imaging', 'Riya Singh', '2001-11-05', 'Cell Biology',
2022),
('FP005', 'Algorithm Optimization', 'Arjun Mishra', '2002-04-19', 'Data
Structures', 2022),
('FP006', 'Thermodynamics Experiment', 'Kriti Sharma', '2001-08-22',
'Thermodynamics', 2022),
('FP007', 'Circuit Design Project', 'Naveen Kumar', '2002-05-31',
'Circuits', 2022),
('FP008', 'Bridge Analysis', 'Tanya Paul', '2002-02-17', 'Structural
Analysis', 2022),
('FP009', 'Market Research', 'Deepak Yadav', '2001-12-02',
'Microeconomics', 2022),
('FP010', 'Behavioral Study', 'Shikha Pathak', '2002-03-13', 'Social
Psychology', 2022),
('FP011', 'Historical Survey', 'Manav Joshi', '2001-06-11', 'World
History', 2022),
('FP012', 'Logic Puzzle Solver', 'Isha Malhotra', '2002-09-10', 'Logic',
2022);
```

## Problem #2: Scientific Publication Database

### E-R Diagram



# Assumptions

Assumption
1. Primary key for Lab-Equipment is Name, Calibration Standard.
2. Primary key for Journal-Issue is Volume-Id and Title.
3. Primary key for Research-Paper is Paper-Id
4. Each Research-Paper must have Authors.
5. Each Research-Paper must have Lead-Authors and exactly one lead-Author.
6. Each Research-Paper must contain be contained in exactly one Journal-Issue.
7. Each Journal-Issue must have exactly one Editor-in-chief.
Lead-Author must have to be author of Research-Paper!

# Relational Schema

Relational schema FK → Foreign key

Researcher

Employee-Id	Name	Office-address	Phone-extension
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Lab-Equipment

Name	Calibration standard
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User

Employee-Id	Equipment-Name	Calibration standard
FK Ref. Researcher	FK Ref. Lab-Equipment (Name)	FK Ref. Lab-Equipment

Journal-Issue

Volume-Id	Title	Date	Format	Employee-Id
				FK Ref. Researcher Not Null

Research-Paper

Paper-Id	Title	Lead-Author	Volume-Id	Title
		FK Ref. Researcher (Employee-Id) Not Null	FK Ref. J.I. Not Null	FK Ref. J.I. Not Null

\*\* J.I → Journal Issue.

Authors

Employee-Id	Paper-Id
FK Ref. Researcher	F.k. Ref. Research-paper

# Sql Script

```
-- Researcher Table
CREATE TABLE Researcher (
    Employee_Id INT PRIMARY KEY,
    Name VARCHAR(100),
    Office_address VARCHAR(100),
    Phone_extention VARCHAR(20)
) ;

INSERT INTO Researcher VALUES
(1, 'Amit Kumar', 'A-101', '1010'),
(2, 'Nidhi Sharma', 'A-102', '1011'),
(3, 'Ravi Patel', 'B-201', '1012'),
(4, 'Sunita Rao', 'B-202', '1013'),
(5, 'Prakash Singh', 'C-301', '1014'),
(6, 'Meena John', 'C-302', '1015'),
(7, 'Rahul Jain', 'D-401', '1016'),
(8, 'Priya Roy', 'D-401', '1016'),
(9, 'Ashok Mehra', 'E-501', '1018'),
(10, 'Divya Gupta', 'E-502', '1019');

-- Lab_Equipment Table
CREATE TABLE Lab_Equipment (
    Name VARCHAR(50),
    Calibration_standard VARCHAR(50),
    PRIMARY KEY (Name, Calibration_standard)
) ;

INSERT INTO Lab_Equipment VALUES
('Microscope', 'ISO-9001'),
('Centrifuge', 'ISO-13485'),
('Spectrometer', 'ISO-17025'),
('pH Meter', 'ISO-9001'),
('Oven', 'ISO-13485'),
('Freezer', 'ISO-17025'),
('Balance', 'ISO-9001'),
('Incubator', 'ISO-13485'),
('Hot Plate', 'ISO-17025'),
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('Water Bath', 'ISO-9001');

-- Uses Table
CREATE TABLE Uses (
    Employee_Id INT,
    Equipment_Name VARCHAR(50),
    Calibration_Standard VARCHAR(50),
    PRIMARY KEY (Employee_Id, Equipment_Name, Calibration_Standard),
    FOREIGN KEY (Employee_Id) REFERENCES Researcher(Employee_Id),
    FOREIGN KEY (Equipment_Name, Calibration_Standard) REFERENCES
Lab_Equipment(Name, Calibration_Standard)
);

INSERT INTO Uses VALUES
(1, 'Microscope', 'ISO-9001'),
(2, 'Centrifuge', 'ISO-13485'),
(3, 'Spectrometer', 'ISO-17025'),
(4, 'pH Meter', 'ISO-9001'),
(5, 'Oven', 'ISO-13485'),
(6, 'Freezer', 'ISO-17025'),
(7, 'Balance', 'ISO-9001'),
(8, 'Incubator', 'ISO-13485'),
(9, 'Hot Plate', 'ISO-17025'),
(10, 'Water Bath', 'ISO-9001');

-- Journal_Issue Table (Composite Primary Key)
CREATE TABLE Journal_Issue (
    Volume_Id INT,
    Title VARCHAR(100),
    Date DATE,
    Format VARCHAR(50),
    Employee_Id INT NOT NULL,
    PRIMARY KEY (Volume_Id, Title),
    FOREIGN KEY (Employee_Id) REFERENCES Researcher(Employee_Id)
);

INSERT INTO Journal_Issue VALUES
(101, 'Science Monthly', '2025-01-01', 'Print', 1),
(102, 'Physics Update', '2025-01-15', 'Online', 2),
(103, 'Chem Research', '2025-02-01', 'Print', 3),

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(104, 'Lab Innovations', '2025-02-15', 'Print', 4),
(105, 'Materials Review', '2025-03-01', 'Online', 5),
(106, 'Genetics Monthly', '2025-03-15', 'Print', 6),
(107, 'Medical Journal', '2025-04-01', 'Online', 7),
(108, 'Environmental Science', '2025-04-15', 'Print', 8),
(109, 'Nano Letters', '2025-05-01', 'Online', 9),
(110, 'Biology Today', '2025-05-15', 'Print', 10);

-- Research_Paper Table
CREATE TABLE Research_Paper (
    Paper_Id INT PRIMARY KEY,
    Title VARCHAR(100),
    Lead_Author INT NOT NULL,
    Volume_Id INT NOT NULL,
    JTitle VARCHAR(100) NOT NULL,
    FOREIGN KEY (Lead_Author) REFERENCES Researcher(Employee_Id),
    FOREIGN KEY (Volume_Id, JTitle) REFERENCES Journal_Issue(Volume_Id,
    Title)
);

INSERT INTO Research_Paper VALUES
(201, 'Microbial Genetics', 1, 101, 'Science Monthly'),
(202, 'Quantum Effects', 2, 102, 'Physics Update'),
(203, 'Bioinformatics', 3, 103, 'Chem Research'),
(204, 'Chemical Sensors', 4, 104, 'Lab Innovations'),
(205, 'Nanomaterials', 5, 105, 'Materials Review'),
(206, 'Genome Mapping', 6, 106, 'Genetics Monthly'),
(207, 'Heart Disease', 7, 107, 'Medical Journal'),
(208, 'Plastic Pollution', 8, 108, 'Environmental Science'),
(209, 'Battery Tech', 9, 109, 'Nano Letters'),
(210, 'Nano Drug Delivery', 10, 110, 'Biology Today');

-- Authors Table
CREATE TABLE Authors (
    Employee_Id INT,
    Paper_Id INT,
    PRIMARY KEY (Employee_Id, Paper_Id),
    FOREIGN KEY (Employee_Id) REFERENCES Researcher(Employee_Id),
    FOREIGN KEY (Paper_Id) REFERENCES Research_Paper(Paper_Id)
);

```

```
-- Lead authors + co-authors
INSERT INTO Authors VALUES
(1, 201), (2, 201),
(2, 202), (3, 202),
(3, 203), (4, 203),
(4, 204), (5, 204),
(5, 205), (6, 205),
(6, 206), (7, 206),
(7, 207), (8, 207),
(8, 208), (9, 208),
(9, 209), (10, 209),
(10, 210), (1, 210);
```