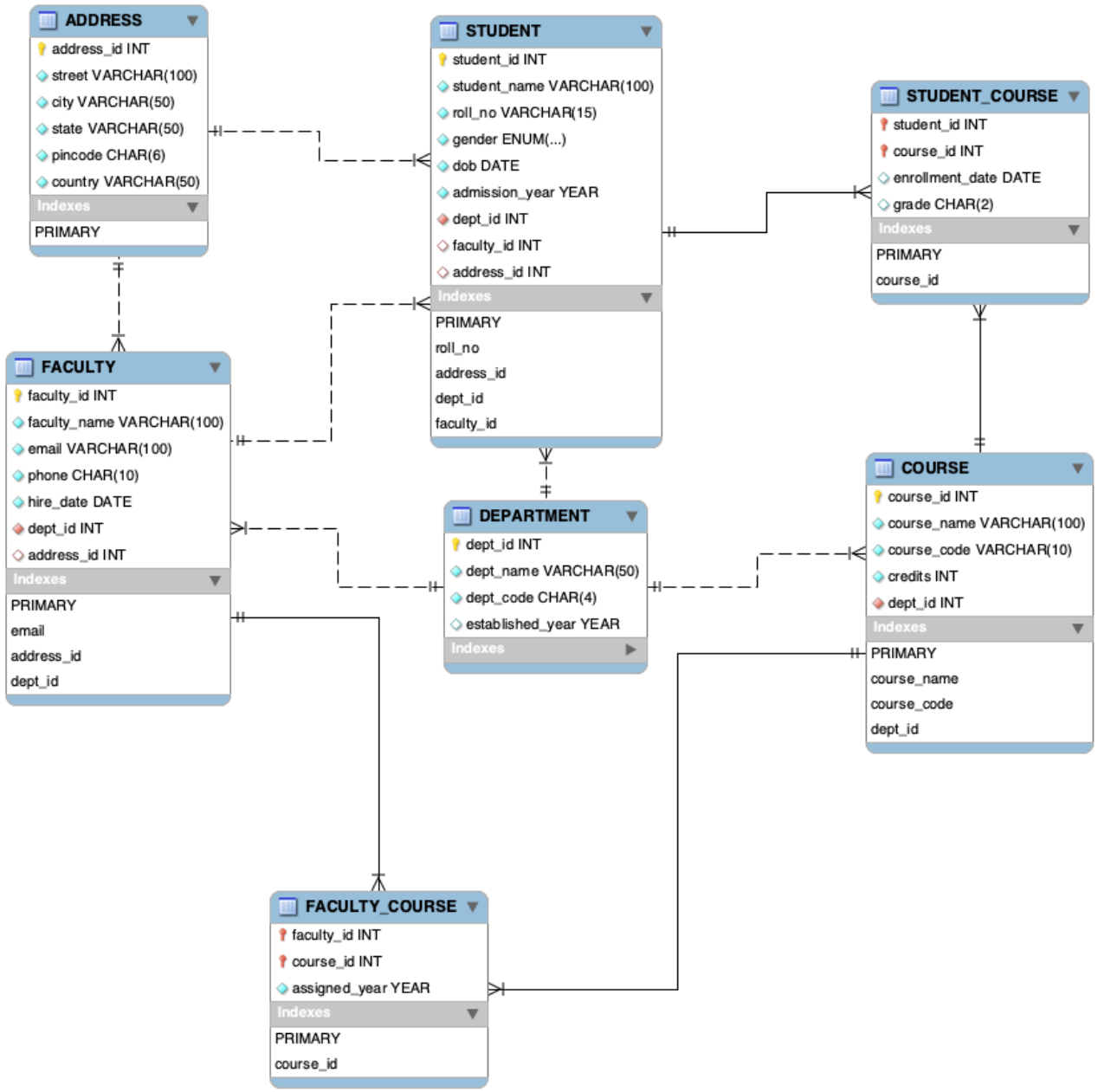
College Management System

ER diagram



Normalized Schema

We'll have these tables:

1. ADDRESS
2. DEPARTMENT
3. FACULTY
4. COURSE
5. STUDENT
6. STUDENT_COURSE (for N:M)
7. FACULTY_COURSE (for N:M)

🏠 1. ADDRESS

```
CREATE TABLE ADDRESS (
    address_id INT AUTO_INCREMENT PRIMARY KEY,
    street VARCHAR(100) NOT NULL,
    city VARCHAR(50) NOT NULL,
    state VARCHAR(50) NOT NULL,
    pincode CHAR(6) NOT NULL CHECK (pincode REGEXP '^[1-9][0-9]{5}$'),
    country VARCHAR(50) DEFAULT 'India' NOT NULL
);
```

✅ CHECK ensures valid 6-digit Indian PIN.

✅ Default country = *India*

🏛️ 2. DEPARTMENT

```
CREATE TABLE DEPARTMENT (
    dept_id INT AUTO_INCREMENT PRIMARY KEY,
    dept_name VARCHAR(50) NOT NULL UNIQUE,
    dept_code CHAR(4) NOT NULL UNIQUE CHECK (dept_code REGEXP '^[A-Z]{2}[0-9]{2}$'),
    established_year YEAR CHECK (established_year >= 1950),
    address_id INT UNIQUE,
    FOREIGN KEY (address_id) REFERENCES ADDRESS(address_id)
        ON DELETE SET NULL ON UPDATE CASCADE
);
```

✅ 1:1 with ADDRESS

✅ Example: “CS01” for Computer Science

👨‍🏫 3. FACULTY

```
CREATE TABLE FACULTY (
   faculty_id INT AUTO_INCREMENT PRIMARY KEY,
   faculty_name VARCHAR(100) NOT NULL,
   email VARCHAR(100) UNIQUE NOT NULL CHECK (email REGEXP ‘^[A-Za-z0-9._%+-]
+@(gmail|yahoo)+\\.(com|edu.in|co.in)$’),
   phone CHAR(10) NOT NULL CHECK (phone REGEXP '^[6-9][0-9]{9}$'),
   hire_date DATE NOT NULL,
   dept_id INT NOT NULL,
   address_id INT UNIQUE,
   FOREIGN KEY (dept_id) REFERENCES DEPARTMENT(dept_id)
      ON DELETE CASCADE ON UPDATE CASCADE,
   FOREIGN KEY (address_id) REFERENCES ADDRESS(address_id)
      ON DELETE SET NULL ON UPDATE CASCADE
);
```

✅ Each faculty belongs to one department

✅ Each faculty has a unique address

✅ Email + phone validated via regex

📘 4. COURSE

```
CREATE TABLE COURSE (
   course_id INT AUTO_INCREMENT PRIMARY KEY,
   course_name VARCHAR(100) NOT NULL UNIQUE,
   course_code VARCHAR(10) NOT NULL UNIQUE CHECK (course_code REGEXP '^[A-Z]{3}
[0-9]{3}$'),
   credits INT NOT NULL CHECK (credits BETWEEN 1 AND 5),
   dept_id INT NOT NULL,
   FOREIGN KEY (dept_id) REFERENCES DEPARTMENT(dept_id)
      ON DELETE CASCADE ON UPDATE CASCADE
```

);

✅ Belongs to one department

✅ CSE101 style course codes

✅ Credit limit enforced

👨‍🎓 5. STUDENT

```
CREATE TABLE STUDENT (
   student_id INT AUTO_INCREMENT PRIMARY KEY,
   student_name VARCHAR(100) NOT NULL,
   roll_no VARCHAR(15) NOT NULL UNIQUE CHECK (roll_no REGEXP '^[A-Z]{2}[0-9]{4}$'),
   gender ENUM('Male','Female','Other') NOT NULL,
   dob DATE NOT NULL,
   admission_year YEAR NOT NULL CHECK (admission_year >= 2000),
   dept_id INT NOT NULL,
   faculty_id INT,
   address_id INT UNIQUE,
   FOREIGN KEY (dept_id) REFERENCES DEPARTMENT(dept_id)
      ON DELETE CASCADE ON UPDATE CASCADE,
   FOREIGN KEY (faculty_id) REFERENCES FACULTY(faculty_id)
      ON DELETE SET NULL ON UPDATE CASCADE,
   FOREIGN KEY (address_id) REFERENCES ADDRESS(address_id)
      ON DELETE SET NULL ON UPDATE CASCADE
);
```

✅ faculty_id → N:1 relationship

✅ address_id → 1:1

✅ Enforces valid roll format like CS1234

✅ dob < today

🧾 6. STUDENT_COURSE (for N:M between STUDENT & COURSE)

```
CREATE TABLE STUDENT_COURSE (
   student_id INT NOT NULL,
   course_id INT NOT NULL,
   enrollment_date DATE DEFAULT (CURRENT_DATE),
   grade CHAR(2) CHECK (grade REGEXP '^[A-F][+-]?$' OR grade IS NULL),
   PRIMARY KEY (student_id, course_id),
   FOREIGN KEY (student_id) REFERENCES STUDENT(student_id)
      ON DELETE CASCADE ON UPDATE CASCADE,
   FOREIGN KEY (course_id) REFERENCES COURSE(course_id)
      ON DELETE CASCADE ON UPDATE CASCADE
);
```

✅ Composite PK

✅ Grade must be valid letter (A+, B-, etc.)

👨‍🏫 7. FACULTY_COURSE (for N:M between FACULTY & COURSE)

```
CREATE TABLE FACULTY_COURSE (
   faculty_id INT NOT NULL,
   course_id INT NOT NULL,
   assigned_year YEAR NOT NULL CHECK (assigned_year >= 2000),
   PRIMARY KEY (faculty_id, course_id),
   FOREIGN KEY (faculty_id) REFERENCES FACULTY(faculty_id)
      ON DELETE CASCADE ON UPDATE CASCADE,
   FOREIGN KEY (course_id) REFERENCES COURSE(course_id)
      ON DELETE CASCADE ON UPDATE CASCADE
);
```

✅ Composite PK

✅ Each faculty can teach multiple courses and vice versa

✅ ORDER OF CREATION

To avoid FK errors:

1. ADDRESS
2. DEPARTMENT
3. FACULTY
4. COURSE
5. STUDENT
6. STUDENT_COURSE
7. FACULTY_COURSE

Summary of Relationship Implementation

Relationship	SQL Implementation
STUDENT–ADDRESS (1:1)	STUDENT.address_id UNIQUE FK → ADDRESS.address_id
FACULTY–ADDRESS (1:1)	FACULTY.address_id UNIQUE FK → ADDRESS.address_id
DEPARTMENT–ADDRESS (1:1)	DEPARTMENT.address_id UNIQUE FK → ADDRESS.address_id
STUDENT–DEPARTMENT (M:1)	STUDENT.dept_id FK → DEPARTMENT.dept_id
FACULTY–DEPARTMENT (M:1)	FACULTY.dept_id FK → DEPARTMENT.dept_id
COURSE–DEPARTMENT (M:1)	COURSE.dept_id FK → DEPARTMENT.dept_id
STUDENT–FACULTY (N:1)	STUDENT.faculty_id FK → FACULTY.faculty_id
STUDENT–COURSE (N:M)	STUDENT_COURSE bridge
FACULTY–COURSE (N:M)	FACULTY_COURSE bridge

DDL: Alter

Now we perform **ALTER TABLE** operations **in a real-world sequence** to evolve the DB.

🔷 1. ADD COLUMN

Example: add a blood_group column to STUDENT

```
ALTER TABLE STUDENT
ADD COLUMN blood_group ENUM('A+','A-','B+','B-','AB+','AB-','O+','O-') AFTER gender;
```

✅ Adds after gender

✅ ENUM restricts values

✅ Ideal for controlled domain data

🔷 2. MODIFY COLUMN

Example: change phone length in FACULTY from 10 → 12 digits to include country code

```
ALTER TABLE FACULTY
MODIFY COLUMN phone VARCHAR(12)
CHECK (phone REGEXP '^(\\+91)?[6-9][0-9]{9}$');
```

✅ Retains data but modifies definition

✅ Adds new CHECK constraint with regex for optional “+91”

🔷 3. DROP (DELETE) COLUMN

Example: remove established_year from DEPARTMENT

```
ALTER TABLE DEPARTMENT
DROP COLUMN established_year;
```

✅ Removes column entirely

✅ All dependent constraints are dropped automatically

🔷 4. ADD CONSTRAINTS (after table creation)

➕ ADD UNIQUE constraint

ALTER TABLE STUDENT

ADD CONSTRAINT uq_student_roll UNIQUE (roll_no);

✅ Ensures roll number uniqueness if not already defined

➕ ADD FOREIGN KEY constraint

Suppose we accidentally missed the faculty link earlier — we can add it later:

ALTER TABLE STUDENT

ADD CONSTRAINT fk_student_faculty

FOREIGN KEY (faculty_id) REFERENCES FACULTY(faculty_id)

ON DELETE SET NULL ON UPDATE CASCADE;

✅ Adds referential integrity

✅ Safe cascading policy

➕ ADD CHECK constraint

Let's enforce that credits must be between 1 and 5 in COURSE:

ALTER TABLE COURSE

ADD CONSTRAINT chk_course_credit CHECK (credits BETWEEN 1 AND 5);

✅ Works in MySQL 8.0+

✅ Enforces business rule

➕ ADD DEFAULT constraint

ALTER TABLE STUDENT

ALTER COLUMN admission_year SET DEFAULT YEAR(CURDATE());

✅ Defaults current year for admission if not provided

🔷 5. DROP CONSTRAINTS

❌ DROP FOREIGN KEY

ALTER TABLE STUDENT

DROP FOREIGN KEY fk_student_faculty;

✅ Note: need constraint name (you can check via SHOW CREATE TABLE STUDENT;)

❌ DROP UNIQUE constraint

ALTER TABLE STUDENT

DROP INDEX uq_student_roll;

✅ UNIQUE constraints are indexes in MySQL

❌ DROP CHECK constraint

ALTER TABLE COURSE

DROP CHECK chk_course_credit;

✅ Removes data range validation

🔷 6. RENAME COLUMN

Example: rename faculty_name → name in FACULTY

ALTER TABLE FACULTY

RENAME COLUMN faculty_name TO name;

✅ Keeps data intact, changes only column name

🔷 7. RENAME TABLE

Example: rename STUDENT_COURSE → ENROLLMENT

RENAME TABLE STUDENT_COURSE TO ENROLLMENT;

✅ Automatically keeps constraints if referenced properly

⚙️ QUICK DEMO COMBO (for class lab)

Here's a mini-sequence showing multiple operations in one go 👇

```
-- Add a new column
ALTER TABLE STUDENT ADD COLUMN guardian_name VARCHAR(100);

-- Modify the column length and add CHECK
ALTER TABLE STUDENT MODIFY COLUMN guardian_name VARCHAR(150)
CHECK (guardian_name REGEXP '^[A-Za-z ]+$');

-- Rename the column
ALTER TABLE STUDENT RENAME COLUMN guardian_name TO parent_name;

-- Add a default constraint
ALTER TABLE STUDENT ALTER COLUMN gender SET DEFAULT 'Other';

-- Add a new foreign key constraint
ALTER TABLE STUDENT
ADD CONSTRAINT fk_student_dept FOREIGN KEY (dept_id)
REFERENCES DEPARTMENT(dept_id) ON DELETE CASCADE ON UPDATE CASCADE;

-- Drop the column if not needed later
ALTER TABLE STUDENT DROP COLUMN parent_name;
```

DDL: Drop and Truncate

1. Concept: DROP vs TRUNCATE

Feature	DROP TABLE	TRUNCATE TABLE
Purpose	Deletes the **entire table structure**	Deletes **all data only**, keeps structure
Removes constraints	✅ Yes (drops PK, FK, indexes, etc.)	❌ No (constraints remain)
Resets AUTO_INCREMENT	✅ (table gone)	✅ (resets to 1)
Can be rolled back (in MySQL with autocommit=off)?	❌ No	❌ No
Affects dependent tables	❌ Must drop dependents first	❌ Fails if referenced by FK
Speed	Slower (metadata removal)	Super fast (data page wipe)

⚙️ 2. Correct Execution Order (Due to FKs)

To **TRUNCATE or DROP safely**, always go from **child → parent**
(so FKs don't block you).

Correct Dependency Order:

FACULTY_COURSE

STUDENT_COURSE

STUDENT

COURSE

FACULTY

DEPARTMENT

ADDRESS

🧹 3. TRUNCATE Queries (Delete Data but Keep Structure)

-- 1️⃣ Disable foreign key checks (required for TRUNCATE)

```
SET FOREIGN_KEY_CHECKS = 0;

TRUNCATE TABLE FACULTY_COURSE;
TRUNCATE TABLE STUDENT_COURSE;
```

```
TRUNCATE TABLE STUDENT;
TRUNCATE TABLE COURSE;
TRUNCATE TABLE FACULTY;
TRUNCATE TABLE DEPARTMENT;
TRUNCATE TABLE ADDRESS;


-- 2️⃣ Re-enable foreign key checks
SET FOREIGN_KEY_CHECKS = 1;
```

✅ This will **empty all tables**

✅ Auto-increment values reset

✅ FKs & structure remain intact

✅ Fastest way to “clear data” before new semester/student batch 😄

💣 4. DROP Queries (Delete Structure + Constraints)

When you want to completely **remove the schema**, do it in reverse dependency order:

```
-- 1️⃣ Disable FK checks to allow parent-child drops
SET FOREIGN_KEY_CHECKS = 0;

DROP TABLE IF EXISTS FACULTY_COURSE;
DROP TABLE IF EXISTS STUDENT_COURSE;
DROP TABLE IF EXISTS STUDENT;
DROP TABLE IF EXISTS COURSE;
DROP TABLE IF EXISTS FACULTY;
DROP TABLE IF EXISTS DEPARTMENT;
DROP TABLE IF EXISTS ADDRESS;

-- 2️⃣ Re-enable FK checks
SET FOREIGN_KEY_CHECKS = 1;
```

✅ Destroys tables and all constraints permanently

✅ Must recreate using CREATE TABLE again

✅ Best used when restructuring the DB

🧩 5. What Happens After DROP / TRUNCATE

Operation	Table Exists?	Data Exists?	FKs/Constraints	AUTO_INCREMENT Reset?
TRUNCATE	✅ Yes	❌ No	✅ Yes	✅ Yes
DROP	❌ No	❌ No	❌ No	❌ Table gone

INSERT SCRIPT

🏠 1️⃣ ADDRESS

INSERT INTO ADDRESS (street, city, state, pincode, country) VALUES

-- Faculty (1–10)

('12 MG Road', 'Bengaluru', 'Karnataka', '560001', 'India'),

('5 Nehru Street', 'Chennai', 'Tamil Nadu', '600001', 'India'),

('22 Park Lane', 'Hyderabad', 'Telangana', '500001', 'India'),

('9 Marine Drive', 'Mumbai', 'Maharashtra', '400001', 'India'),

('33 Connaught Place', 'New Delhi', 'Delhi', '110001', 'India'),

('14 Brigade Road', 'Bengaluru', 'Karnataka', '560002', 'India'),

('45 Gandhipuram', 'Coimbatore', 'Tamil Nadu', '641012', 'India'),

('8 Anna Nagar', 'Chennai', 'Tamil Nadu', '600040', 'India'),

('6 Sadar Bazaar', 'Pune', 'Maharashtra', '411001', 'India'),

('50 College Road', 'Chennai', 'Tamil Nadu', '600006', 'India'),

-- Students (11–60)

('2 Rajaji Salai', 'Puducherry', 'Puducherry', '605001', 'India'),

('10 Park Street', 'Kolkata', 'West Bengal', '700016', 'India'),

('78 Civil Lines', 'Nagpur', 'Maharashtra', '440001', 'India'),

('88 MG Road', 'Ernakulam', 'Kerala', '682016', 'India'),

('21 Ring Road', 'Delhi', 'Delhi', '110002', 'India'),

('5 Race Course', 'Coimbatore', 'Tamil Nadu', '641018', 'India'),

('66 Tilak Road', 'Jaipur', 'Rajasthan', '302001', 'India'),

('8 VIP Colony', 'Bhopal', 'Madhya Pradesh', '462001', 'India'),

('44 Park Avenue', 'Mysuru', 'Karnataka', '570001', 'India'),

('9 Fort Area', 'Madurai', 'Tamil Nadu', '625001', 'India'),

('1 Gandhi Street', 'Salem', 'Tamil Nadu', '636001', 'India'),

('4 Patel Road', 'Surat', 'Gujarat', '395001', 'India'),

('16 MG Road', 'Trichy', 'Tamil Nadu', '620001', 'India'),

('25 Hill View', 'Shimla', 'Himachal Pradesh', '171001', 'India'),

('11 Race Course', 'Coimbatore', 'Tamil Nadu', '641018', 'India'),

('30 Residency Road', 'Bengaluru', 'Karnataka', '560025', 'India'),

('22 City Center', 'Indore', 'Madhya Pradesh', '452001', 'India'),

('18 Gandhi Marg', 'Lucknow', 'Uttar Pradesh', '226001', 'India'),
('2 MG Street', 'Vizag', 'Andhra Pradesh', '530001', 'India'),
('40 R.S. Puram', 'Coimbatore', 'Tamil Nadu', '641002', 'India'),
('12 Phoenix Bay', 'Port Blair', 'Andaman', '744101', 'India'),
('5 Mount Road', 'Chennai', 'Tamil Nadu', '600002', 'India'),
('9 Temple Road', 'Kanchipuram', 'Tamil Nadu', '631501', 'India'),
('42 MG Circle', 'Mysuru', 'Karnataka', '570002', 'India'),
('27 Palace Road', 'Bengaluru', 'Karnataka', '560052', 'India'),
('18 Station Road', 'Madurai', 'Tamil Nadu', '625002', 'India'),
('13 Cross Street', 'Kochi', 'Kerala', '682020', 'India'),
('7 Park Avenue', 'Pune', 'Maharashtra', '411004', 'India'),
('8 Beach Road', 'Chennai', 'Tamil Nadu', '600004', 'India'),
('23 Main Street', 'Coimbatore', 'Tamil Nadu', '641014', 'India'),
('15 Anna Salai', 'Chennai', 'Tamil Nadu', '600018', 'India'),
('10 Green Park', 'Delhi', 'Delhi', '110016', 'India'),
('5 Lake View', 'Ooty', 'Tamil Nadu', '643001', 'India'),
('2 High Street', 'Madurai', 'Tamil Nadu', '625003', 'India'),
('7 Church Road', 'Vellore', 'Tamil Nadu', '632001', 'India'),
('6 Residency Lane', 'Hyderabad', 'Telangana', '500002', 'India'),
('13 MG Layout', 'Bengaluru', 'Karnataka', '560030', 'India'),
('14 Green Road', 'Kochi', 'Kerala', '682015', 'India'),
('19 Canal Street', 'Kolkata', 'West Bengal', '700013', 'India'),
('28 Bridge Road', 'Trivandrum', 'Kerala', '695001', 'India'),
('5 Rose Avenue', 'Coimbatore', 'Tamil Nadu', '641011', 'India'),
('4 Club Road', 'Salem', 'Tamil Nadu', '636002', 'India'),
('8 Vivekananda Street', 'Erode', 'Tamil Nadu', '638001', 'India'),
('21 Park Avenue', 'Chennai', 'Tamil Nadu', '600041', 'India'),
('15 City Road', 'Madurai', 'Tamil Nadu', '625004', 'India'),
('9 Hill Top', 'Trichy', 'Tamil Nadu', '620002', 'India'),
('3 MG Cross', 'Coimbatore', 'Tamil Nadu', '641005', 'India'),
('6 Gandhi Road', 'Kanchipuram', 'Tamil Nadu', '631502', 'India'),
('7 College Street', 'Vellore', 'Tamil Nadu', '632002', 'India'),
('4 Rose Lane', 'Salem', 'Tamil Nadu', '636004', 'India'),
('5 Park View', 'Chennai', 'Tamil Nadu', '600005', 'India');

🏛️ 2️⃣ DEPARTMENT

INSERT INTO DEPARTMENT (dept_name, dept_code, established_year)

VALUES

('Computer Science', 'CS01', 2002),

('Information Technology', 'IT02', 2005),

('Electronics', 'EC03', 2001);

👨‍🏫 3️⃣ FACULTY (each mapped to address_id 1–10)

INSERT INTO FACULTY (faculty_name, email, phone, hire_date, dept_id, address_id)

VALUES

('Dr. Ramesh Kumar', 'ramesh.cs@univ.edu', '9876543210', '2010-06-15', 1, 1),

('Ms. Priya Menon', 'priya.it@univ.edu', '9898989898', '2012-07-10', 2, 2),

('Mr. Arjun Das', 'arjun.ec@univ.edu', '9123456789', '2015-01-20', 3, 3),

('Dr. Sneha Rao', 'sneha.cs@univ.edu', '9765432109', '2013-11-25', 1, 4),

('Mr. Vijay Nair', 'vijay.it@univ.edu', '9988776655', '2018-03-15', 2, 5),

('Dr. Kavitha S', 'kavitha.ec@univ.edu', '9784561230', '2009-04-12', 3, 6),

('Mr. Rajesh Pillai', 'rajesh.cs@univ.edu', '9898123456', '2017-05-22', 1, 7),

('Ms. Deepa Krishnan', 'deepa.it@univ.edu', '9789012345', '2020-01-08', 2, 8),

('Mr. Sanjay Verma', 'sanjay.ec@univ.edu', '9876501234', '2011-09-14', 3, 9),

('Dr. Meera Iyer', 'meera.cs@univ.edu', '9654321098', '2008-02-19', 1, 10);

📘 4️⃣ COURSE (20 courses, 3 depts)

INSERT INTO COURSE (course_name, course_code, credits, dept_id)

VALUES

('Data Structures', 'CSE101', 4, 1),

('Algorithms', 'CSE102', 4, 1),

('Operating Systems', 'CSE103', 3, 1),

('Database Management', 'CSE104', 3, 1),

('Computer Networks', 'CSE105', 4, 1),

('AI Fundamentals', 'CSE106', 4, 1),

('Cyber Security', 'CSE107', 3, 1),

('Web Programming', 'ITE201', 3, 2),

('Software Engineering', 'ITE202', 4, 2),
('Mobile App Development', 'ITE203', 3, 2),
('Machine Learning', 'ITE204', 4, 2),
('Cloud Computing', 'ITE205', 3, 2),
('Python Programming', 'ITE206', 3, 2),
('Data Analytics', 'ITE207', 3, 2),
('Digital Circuits', 'ECE301', 3, 3),
('Signals & Systems', 'ECE302', 4, 3),
('Microprocessors', 'ECE303', 4, 3),
('Embedded Systems', 'ECE304', 3, 3),
('VLSI Design', 'ECE305', 4, 3),
('IoT Applications', 'ECE306', 3, 3);

👨‍🎓 5️⃣ STUDENT (50 records, using address_id 11–60)

-- Each student gets unique address_id 11–60
INSERT INTO STUDENT (student_name, roll_no, gender, dob, admission_year, dept_id, faculty_id, address_id)
VALUES
('Aarav Kumar', 'CS1001', 'Male', '2003-05-12', 2021, 1, 1, 11),
('Ananya Sharma', 'CS1002', 'Female', '2002-09-18', 2020, 1, 4, 12),
('Vikram Singh', 'CS1003', 'Male', '2003-11-22', 2021, 1, 7, 13),
('Meera Nair', 'CS1004', 'Female', '2004-03-10', 2022, 1, 10, 14),
('Rohan Das', 'CS1005', 'Male', '2003-08-02', 2021, 1, 1, 15),
('Sneha Pillai', 'IT2001', 'Female', '2003-07-15', 2021, 2, 2, 16),
('Rahul Iyer', 'IT2002', 'Male', '2004-04-09', 2022, 2, 5, 17),
('Diya Menon', 'IT2003', 'Female', '2003-01-23', 2021, 2, 8, 18),
('Ayaan Patel', 'IT2004', 'Male', '2002-12-11', 2020, 2, 2, 19),
('Priya Raj', 'IT2005', 'Female', '2003-02-17', 2021, 2, 5, 20),
('Harish Rao', 'EC3001', 'Male', '2002-08-09', 2020, 3, 3, 21),
('Keerthi Balan', 'EC3002', 'Female', '2003-05-05', 2021, 3, 6, 22),
('Naveen Krishnan', 'EC3003', 'Male', '2004-07-14', 2022, 3, 9, 23),
('Aishwarya R', 'EC3004', 'Female', '2003-06-19', 2021, 3, 3, 24),
('Siddharth M', 'EC3005', 'Male', '2002-11-12', 2020, 3, 6, 25),
('Tanya Iyer', 'CS1006', 'Female', '2004-09-25', 2022, 1, 7, 26),

('Ravi Kiran', 'CS1007', 'Male', '2003-04-16', 2021, 1, 1, 27),
('Leena George', 'CS1008', 'Female', '2002-10-08', 2020, 1, 10, 28),
('Arjun Mehta', 'CS1009', 'Male', '2003-02-02', 2021, 1, 4, 29),
('Nisha B', 'CS1010', 'Female', '2003-07-21', 2021, 1, 4, 30),
('Dinesh Pillai', 'IT2006', 'Male', '2004-06-10', 2022, 2, 8, 31),
('Aarti Joshi', 'IT2007', 'Female', '2003-03-30', 2021, 2, 2, 32),
('Manoj Verma', 'IT2008', 'Male', '2003-12-19', 2021, 2, 5, 33),
('Sanjana Rao', 'IT2009', 'Female', '2004-02-08', 2022, 2, 8, 34),
('Deepak Nair', 'IT2010', 'Male', '2003-08-14', 2021, 2, 2, 35),
('Riya Patel', 'EC3006', 'Female', '2002-05-06', 2020, 3, 6, 36),
('Abhinav S', 'EC3007', 'Male', '2003-09-12', 2021, 3, 3, 37),
('Divya Suresh', 'EC3008', 'Female', '2003-10-15', 2021, 3, 9, 38),
('Tarun Raj', 'EC3009', 'Male', '2004-03-18', 2022, 3, 6, 39),
('Isha Mohan', 'EC3010', 'Female', '2003-11-25', 2021, 3, 9, 40),
('Karthik R', 'CS1011', 'Male', '2003-09-01', 2021, 1, 7, 41),
('Lavanya I', 'CS1012', 'Female', '2002-11-30', 2020, 1, 1, 42),
('Ankit P', 'CS1013', 'Male', '2003-04-07', 2021, 1, 4, 43),
('Snehal K', 'CS1014', 'Female', '2003-07-02', 2021, 1, 10, 44),
('Nikhil J', 'CS1015', 'Male', '2002-10-29', 2020, 1, 10, 45),
('Tanvi V', 'IT2011', 'Female', '2003-06-22', 2021, 2, 8, 46),
('Rajat L', 'IT2012', 'Male', '2004-05-01', 2022, 2, 5, 47),
('Shruti S', 'IT2013', 'Female', '2003-03-05', 2021, 2, 5, 48),
('Suresh R', 'IT2014', 'Male', '2002-09-09', 2020, 2, 2, 49),
('Charan D', 'IT2015', 'Male', '2004-01-19', 2022, 2, 8, 50),
('Harini T', 'EC3011', 'Female', '2003-10-02', 2021, 3, 3, 51),
('Ajay K', 'EC3012', 'Male', '2003-06-07', 2021, 3, 9, 52),
('Kavya R', 'EC3013', 'Female', '2003-07-16', 2021, 3, 6, 53),
('Vishal S', 'EC3014', 'Male', '2003-12-12', 2021, 3, 3, 54),
('Pooja V', 'EC3015', 'Female', '2003-11-11', 2021, 3, 6, 55),
('Sidharth K','CS1016', 'Male', '2004-02-10', 2022, 1, 7, 56),
('Neha B', 'CS1017', 'Female', '2003-05-13', 2021, 1, 4, 57),
('Varun T', 'CS1018', 'Male', '2003-09-28', 2021, 1, 10, 58),
('Aisha Z', 'CS1019', 'Female', '2002-12-09', 2020, 1, 1, 59),
('Mohit R', 'CS1020', 'Male', '2004-04-21', 2022, 1, 7, 60);

👩‍🏫 6️⃣ FACULTY_COURSE

INSERT INTO FACULTY_COURSE (faculty_id, course_id, assigned_year)
VALUES
(1,1,2021),(1,2,2022),(1,3,2023),
(2,8,2021),(2,9,2022),(2,10,2023),
(3,15,2021),(3,16,2022),(3,17,2023),
(4,4,2021),(4,5,2022),(4,6,2023),
(5,11,2022),(5,12,2023),
(6,18,2022),(6,19,2023),
(7,1,2023),(7,7,2023),
(8,13,2022),(8,14,2023),
(9,15,2022),(9,20,2023),
(10,2,2023),(10,6,2023);

🎓 7️⃣ STUDENT_COURSE (sample 15 rows, scalable pattern)

INSERT INTO STUDENT_COURSE (student_id, course_id, enrollment_date, grade) VALUES
-- CS Dept students (1 – 5 & 16 – 20 & 31 – 35 & 46 – 50)
(1,1,'2021-06-01','A'),(1,2,'2021-06-01','A-'),(1,3,'2021-06-01','B+'),(1,4,'2021-06-01','A'),
(1,5,'2021-06-01','A-'),
(2,1,'2020-06-01','A'),(2,2,'2020-06-01','B+'),(2,4,'2020-06-01','A'),(2,6,'2020-06-01','B'),
(3,1,'2021-06-01','B+'),(3,3,'2021-06-01','A-'),(3,5,'2021-06-01','A'),
(4,2,'2022-06-01','A'),(4,4,'2022-06-01','A-'),(4,6,'2022-06-01','B+'),(4,7,'2022-06-01','A'),
(5,1,'2021-06-01','B'),(5,3,'2021-06-01','A-'),(5,4,'2021-06-01','A'),
(16,2,'2022-06-01','A'),(16,3,'2022-06-01','A-'),(16,6,'2022-06-01','B+'),
(17,1,'2021-06-01','A'),(17,5,'2021-06-01','A-'),(17,7,'2021-06-01','B'),
(18,3,'2020-06-01','A'),(18,4,'2020-06-01','B+'),(18,6,'2020-06-01','A'),
(19,2,'2021-06-01','A-'),(19,4,'2021-06-01','B+'),(19,5,'2021-06-01','A'),
(20,1,'2021-06-01','B+'),(20,3,'2021-06-01','A'),(20,4,'2021-06-01','A-'),
(31,1,'2021-06-01','A'),(31,2,'2021-06-01','A-'),(31,5,'2021-06-01','A'),
(32,2,'2020-06-01','B+'),(32,3,'2020-06-01','A'),(32,4,'2020-06-01','A-'),
(33,1,'2021-06-01','A-'),(33,3,'2021-06-01','B+'),(33,5,'2021-06-01','A'),
(34,2,'2021-06-01','A'),(34,4,'2021-06-01','A-'),(34,6,'2021-06-01','B+'),
(35,3,'2020-06-01','A'),(35,4,'2020-06-01','B+'),(35,7,'2020-06-01','A'),

(46,1,'2022-06-01','A'),(46,3,'2022-06-01','B+'),(46,4,'2022-06-01','A-'),
(47,2,'2021-06-01','B+'),(47,5,'2021-06-01','A'),(47,7,'2021-06-01','A-'),
(48,1,'2021-06-01','A'),(48,3,'2021-06-01','A-'),(48,6,'2021-06-01','B'),
(49,2,'2020-06-01','A'),(49,4,'2020-06-01','A-'),(49,7,'2020-06-01','B+'),
(50,3,'2022-06-01','A'),(50,4,'2022-06-01','B+'),(50,6,'2022-06-01','A-'),

-- IT Dept students (6 – 10 & 21 – 25 & 36 – 40)
(6,8,'2021-06-01','A'),(6,9,'2021-06-01','B+'),(6,10,'2021-06-01','A-'),(6,11,'2021-06-01','A'),
(7,8,'2022-06-01','A'),(7,9,'2022-06-01','B+'),(7,12,'2022-06-01','A'),(7,13,'2022-06-01','A-'),
(8,9,'2021-06-01','A'),(8,10,'2021-06-01','A-'),(8,12,'2021-06-01','B+'),
(9,8,'2020-06-01','A'),(9,11,'2020-06-01','A-'),(9,13,'2020-06-01','B'),
(10,9,'2021-06-01','B+'),(10,10,'2021-06-01','A-'),(10,11,'2021-06-01','A'),
(21,8,'2022-06-01','A'),(21,10,'2022-06-01','A-'),(21,12,'2022-06-01','B+'),
(22,9,'2021-06-01','A'),(22,11,'2021-06-01','A-'),(22,13,'2021-06-01','B+'),
(23,8,'2021-06-01','A'),(23,10,'2021-06-01','B+'),(23,12,'2021-06-01','A-'),
(24,9,'2022-06-01','A'),(24,10,'2022-06-01','A-'),(24,11,'2022-06-01','A'),
(25,8,'2021-06-01','B+'),(25,9,'2021-06-01','A'),(25,13,'2021-06-01','A-'),
(36,8,'2021-06-01','A'),(36,10,'2021-06-01','A-'),(36,11,'2021-06-01','B+'),
(37,9,'2021-06-01','A'),(37,12,'2021-06-01','B+'),(37,14,'2021-06-01','A'),
(38,8,'2021-06-01','A-'),(38,10,'2021-06-01','A'),(38,11,'2021-06-01','B+'),
(39,9,'2021-06-01','B'),(39,11,'2021-06-01','A-'),(39,13,'2021-06-01','A'),
(40,8,'2022-06-01','A'),(40,10,'2022-06-01','A-'),(40,14,'2022-06-01','B+'),

-- EC Dept students (11 – 15 & 26 – 30 & 41 – 45)
(11,15,'2020-06-01','A'),(11,16,'2020-06-01','A-'),(11,17,'2020-06-01','B+'),
(11,18,'2020-06-01','A'),
(12,15,'2021-06-01','B+'),(12,17,'2021-06-01','A'),(12,18,'2021-06-01','A-'),
(13,15,'2022-06-01','A'),(13,16,'2022-06-01','A-'),(13,18,'2022-06-01','B+'),
(14,17,'2021-06-01','A'),(14,18,'2021-06-01','B+'),(14,19,'2021-06-01','A-'),
(15,16,'2020-06-01','A'),(15,18,'2020-06-01','A-'),(15,20,'2020-06-01','B+'),
(26,15,'2021-06-01','A'),(26,16,'2021-06-01','B+'),(26,18,'2021-06-01','A-'),
(27,15,'2021-06-01','A'),(27,17,'2021-06-01','A-'),(27,19,'2021-06-01','B+'),
(28,16,'2021-06-01','A'),(28,18,'2021-06-01','B+'),(28,19,'2021-06-01','A-'),
(29,15,'2022-06-01','A'),(29,17,'2022-06-01','A-'),(29,20,'2022-06-01','B+'),
(30,15,'2021-06-01','A'),(30,16,'2021-06-01','A-'),(30,19,'2021-06-01','A'),

(41,15,'2021-06-01','A'),(41,16,'2021-06-01','B+'),(41,18,'2021-06-01','A-'),
(42,17,'2020-06-01','A'),(42,18,'2020-06-01','B+'),(42,19,'2020-06-01','A-'),
(43,15,'2021-06-01','A'),(43,18,'2021-06-01','A-'),(43,19,'2021-06-01','B+'),
(44,16,'2021-06-01','B+'),(44,17,'2021-06-01','A'),(44,20,'2021-06-01','A-'),
(45,15,'2021-06-01','A'),(45,18,'2021-06-01','A-'),(45,20,'2021-06-01','B+');