

Create

```
CREATE TABLE COURSE (  
  COURSE_ID INT NOT NULL,  
  COURSE_NAME VARCHAR (100),  
  PRIMARY KEY (COURSE_ID));
```

```
SQL> CREATE TABLE COURSE (  
  2  COURSE_ID INT NOT NULL,  
  3  COURSE_NAME VARCHAR (100),  
  4  PRIMARY KEY (COURSE_ID));
```

Table created.

```
SQL> █
```

```
CREATE TABLE STUDENT (  
  STUDENT_ID INT NOT NULL,  
  STUDENT_NAME VARCHAR (100) NOT NULL,  
  DOB DATE,  
  GENDER CHAR (5) CHECK (GENDER IN('M', 'F', 'O')),  
  CITY VARCHAR (100) NOT NULL,  
  STATE VARCHAR (100),  
  COURSE_ID INT,  
  FOREIGN KEY (COURSE_ID) REFERENCES COURSE(COURSE_ID),  
  PRIMARY KEY (STUDENT_ID) );
```

```
SQL> CREATE TABLE STUDENT (  
  2  STUDENT_ID INT NOT NULL,  
  3  STUDENT_NAME VARCHAR (100) NOT NULL,  
  4  DOB DATE,  
  5  GENDER CHAR (5) CHECK (GENDER IN('M', 'F', 'O')),  
  6  CITY VARCHAR (100) NOT NULL,  
  7  STATE VARCHAR (100),  
  8  COURSE_ID INT,  
  9  FOREIGN KEY (COURSE_ID) REFERENCES COURSE(COURSE_ID),  
 10  PRIMARY KEY (STUDENT_ID) );
```

Table created.

DDL, DML Commands

Insert

INSERT ALL

```
    INTO COURSE (COURSE_ID, COURSE_NAME) VALUES (1, 'Introduction to Programming')
    INTO COURSE (COURSE_ID, COURSE_NAME) VALUES (2, 'Database Management
Systems')
    INTO COURSE (COURSE_ID, COURSE_NAME) VALUES (3, 'Web Development')
    INTO COURSE (COURSE_ID, COURSE_NAME) VALUES (4, 'Machine Learning
Fundamentals')
    INTO COURSE (COURSE_ID, COURSE_NAME) VALUES (5, 'Data Structures and
Algorithms')
SELECT 1 FROM DUAL;
```

```
SQL> INSERT ALL
  2   INTO COURSE (COURSE_ID, COURSE_NAME) VALUES (1, 'Introduction to Programming')
  3   INTO COURSE (COURSE_ID, COURSE_NAME) VALUES (2, 'Database Management Systems')
  4   INTO COURSE (COURSE_ID, COURSE_NAME) VALUES (3, 'Web Development')
  5   INTO COURSE (COURSE_ID, COURSE_NAME) VALUES (4, 'Machine Learning Fundamentals')
  6   INTO COURSE (COURSE_ID, COURSE_NAME) VALUES (5, 'Data Structures and Algorithms')
  7   SELECT 1 FROM DUAL;

5 rows created.

SQL>
SQL> SELECT * from COURSE;

COURSE_ID | COURSE_NAME
-----|-----
        1 | Introduction to Programming
        2 | Database Management Systems
        3 | Web Development
        4 | Machine Learning Fundamentals
        5 | Data Structures and Algorithms
```

INSERT ALL

```
    INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE,
COURSE_ID) VALUES
    (1, 'John Doe', DATE '1995-05-15', 'M', 'Kathmandu', 'Bagmati', 1)
    INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE,
COURSE_ID) VALUES
    (2, 'Jane Smith', DATE '1998-02-28', 'F', 'Pokhara', 'Gandaki', 3)
    INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE,
COURSE_ID) VALUES
    (3, 'Bob Johnson', DATE '1997-09-10', 'M', 'Biratnagar', 'Koshi', 2)
    INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE,
COURSE_ID) VALUES
    (4, 'Alice Williams', DATE '1996-11-20', 'F', 'Lalitpur', 'Bagmati', 4)
    INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE,
COURSE_ID) VALUES
    (5, 'Charlie Brown', DATE '1999-07-05', 'M', 'Bharatpur', 'Bagmati', 5)
```

```

    INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE,
    COURSE_ID) VALUES
    (6, 'Eva Davis', DATE '1994-03-12', 'F', 'Hetauda', 'Bagmati', 1)
    INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE,
    COURSE_ID) VALUES
    (7, 'Michael Clark', DATE '1998-08-25', 'M', 'Butwal', 'Lumbini', 3)
    INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE,
    COURSE_ID) VALUES
    (8, 'Sophia Turner', DATE '1997-01-18', 'F', 'Dharan', 'Koshi', 4)
    INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE,
    COURSE_ID) VALUES
    (9, 'Daniel Lee', DATE '1996-06-30', 'M', 'Nepalgunj', 'Mid-Western', 2)
    INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE,
    COURSE_ID) VALUES
    (10, 'Olivia White', DATE '1999-12-08', 'F', 'Janakpur', 'Janakpur', 5)
SELECT 1 FROM DUAL;

```

```

SQL> INSERT ALL
2   INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE, COURSE_ID, MOBILE_NO) VALUES
3   (1, 'John Doe', DATE '1995-05-15', 'M', 'Kathmandu', 'Bagmati', 1, '9876543210')
4   INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE, COURSE_ID, MOBILE_NO) VALUES
5   (2, 'Jane Smith', DATE '1998-02-28', 'F', 'Pokhara', 'Gandaki', 3, '8765432109')
6   INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE, COURSE_ID, MOBILE_NO) VALUES
7   (3, 'Bob Johnson', DATE '1997-09-10', 'M', 'Biratnagar', 'Koshi', 2, '7654321098')
8   INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE, COURSE_ID, MOBILE_NO) VALUES
9   (4, 'Alice Williams', DATE '1996-11-20', 'F', 'Lalitpur', 'Bagmati', 4, '6543210987')
10  INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE, COURSE_ID, MOBILE_NO) VALUES
11  (5, 'Charlie Brown', DATE '1999-07-05', 'M', 'Bharatpur', 'Bagmati', 5, '5432109876')
12  INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE, COURSE_ID, MOBILE_NO) VALUES
13  (6, 'Eva Davis', DATE '1994-03-12', 'F', 'Hetauda', 'Bagmati', 1, '4321098765')
14  INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE, COURSE_ID, MOBILE_NO) VALUES
15  (7, 'Michael Clark', DATE '1998-08-25', 'M', 'Butwal', 'Lumbini', 3, '3210987654')
16  INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE, COURSE_ID, MOBILE_NO) VALUES
17  (8, 'Sophia Turner', DATE '1997-01-18', 'F', 'Dharan', 'Koshi', 4, '2109876543')
18  INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE, COURSE_ID, MOBILE_NO) VALUES
19  (9, 'Daniel Lee', DATE '1996-06-30', 'M', 'Nepalgunj', 'Mid-Western', 2, '1098765432')
20  INTO STUDENT (STUDENT_ID, STUDENT_NAME, DOB, GENDER, CITY, STATE, COURSE_ID, MOBILE_NO) VALUES
21  (10, 'Olivia White', DATE '1999-12-08', 'F', 'Janakpur', 'Janakpur', 5, '0987654321')
22  SELECT 1 FROM DUAL;

```

10 rows created.

SQL>

SQL> SELECT * FROM STUDENT;

STUDENT_ID	STUDENT_NAME	DOB	G	CITY	STATE	COURSE_ID	MOBILE_NO
1	John Doe	15-MAY-95	M	Kathmandu	Bagmati	1	9876543210
2	Jane Smith	28-FEB-98	F	Pokhara	Gandaki	3	8765432109
3	Bob Johnson	10-SEP-97	M	Biratnagar	Koshi	2	7654321098
4	Alice Williams	20-NOV-96	F	Lalitpur	Bagmati	4	6543210987
5	Charlie Brown	05-JUL-99	M	Bharatpur	Bagmati	5	5432109876
6	Eva Davis	12-MAR-94	F	Hetauda	Bagmati	1	4321098765
7	Michael Clark	25-AUG-98	M	Butwal	Lumbini	3	3210987654
8	Sophia Turner	18-JAN-97	F	Dharan	Koshi	4	2109876543
9	Daniel Lee	30-JUN-96	M	Nepalgunj	Mid-Western	2	1098765432
10	Olivia White	08-DEC-99	F	Janakpur	Janakpur	5	0987654321

10 rows selected.

Alter

ALTER TABLE STUDENT ADD MOBILE_NO VARCHAR(100) UNIQUE;

```
SQL> ALTER TABLE STUDENT ADD MOBILE_NO VARCHAR(100) NOT NULL UNIQUE;  
Table altered.
```

Delete

Delete student with ID 3 DELETE FROM STUDENT WHERE STUDENT_ID = 3

```
SQL> DELETE FROM STUDENT WHERE STUDENT_ID = 3;  
1 row deleted.
```

Update

Update the mobile number of student with ID 4 UPDATE STUDENT SET MOBILE_NO = '9999999999' WHERE STUDENT_ID = 4;

```
SQL> UPDATE STUDENT SET MOBILE_NO = '9999999999' WHERE STUDENT_ID = 4;  
1 row updated.
```

Drop

Drop the MOBILE_NO column from the STUDENT table ALTER TABLE STUDENT DROP COLUMN MOBILE_NO;

```
SQL> ALTER TABLE STUDENT DROP COLUMN MOBILE_NO;  
Table altered.
```

Truncate

TRUNCATE TABLE STUDENT;

```
SQL> TRUNCATE TABLE STUDENT;  
Table truncated.
```

Data Control Language Commands

Add User

CREATE USER C##user1 IDENTIFIED BY password;

Grant

GRANT SELECT, INSERT, UPDATE, DELETE ON STUDENT TO C##user1;

```
SQL> GRANT SELECT, INSERT, UPDATE, DELETE ON STUDENT TO C##user1;
Grant succeeded.
```

Revoke

REVOKE SELECT, INSERT, UPDATE, DELETE ON STUDENT FROM C##user1;

```
SQL> REVOKE SELECT, INSERT, UPDATE, DELETE ON STUDENT FROM C##user1;
Revoke succeeded.
```

Transaction Control Language Commands

Save-point

SAVEPOINT point1;

```
SQL> SAVEPOINT point1;
Savepoint created.
```

Rollback

ROLLBACK TO point1;

```
SQL> ROLLBACK TO point1;
Rollback complete.
```

Aggregate Functions

Avg()

SELECT AVG(COURSE_ID) AS avg_course_id FROM STUDENT;

```
SQL> SELECT AVG(COURSE_ID) AS avg_course_id FROM STUDENT;

AVG_COURSE_ID
-----
              3
```

COUNT ()

SELECT COUNT(*) AS total_students FROM STUDENT;

```
SQL> SELECT COUNT(*) AS total_students FROM STUDENT;

TOTAL_STUDENTS
-----
              10
```

MAX ()

SELECT MAX(MOBILE_NO) AS MAX_mobile_no from student;

```
SQL> SELECT MAX(MOBILE_NO) AS MAX_mobile_no from student;

MAX_MOBILE_NO
-----
9876543210
```

MIN ()

SELECT MIN(MOBILE_NO) AS MIN_mobile_no from student;

```
SQL> SELECT MIN(MOBILE_NO) AS MIN_mobile_no from student;

MIN_MOBILE_NO
-----
0987654321
```

SUM ()

SELECT SUM(COURSE_ID) AS sum_course_id FROM STUDENT;

```
SQL> SELECT SUM(COURSE_ID) AS sum_course_id FROM STUDENT;

SUM_COURSE_ID
-----
              30
```

Commands

Use of OR

SELECT * FROM STUDENT WHERE COURSE_ID = 3 AND GENDER = 'F';

Use of AND

SELECT * FROM STUDENT WHERE CITY IN ('Kathmandu', 'Pokhara', 'Biratnagar');

```
SQL> SELECT * FROM STUDENT WHERE COURSE_ID = 3 AND GENDER = 'F';
```

STUDENT_ID	STUDENT_NAME	DOB	G	CITY	STATE	COURSE_ID	MOBILE_NO
2	Jane Smith	28-FEB-98	F	Pokhara	Gandaki	3	8765432109

Use of IN

SELECT * FROM STUDENT WHERE CITY IN ('Kathmandu', 'Pokhara', 'Biratnagar');

```
SQL>
SQL> SELECT * FROM STUDENT WHERE CITY IN ('Kathmandu', 'Pokhara', 'Biratnagar');
```

STUDENT_ID	STUDENT_NAME	DOB	G	CITY	STATE	COURSE_ID	MOBILE_NO
1	John Doe	15-MAY-95	M	Kathmandu	Bagmati	1	9876543210
2	Jane Smith	28-FEB-98	F	Pokhara	Gandaki	3	8765432109
3	Bob Johnson	10-SEP-97	M	Biratnagar	Koshi	2	7654321098

Use of BETWEEN

SELECT * FROM STUDENT WHERE DOB BETWEEN DATE '1997-01-01' AND DATE '1998-12-31';

```
SQL>
SQL> SELECT * FROM STUDENT WHERE DOB BETWEEN DATE '1997-01-01' AND DATE '1998-12-31';
```

STUDENT_ID	STUDENT_NAME	DOB	G	CITY	STATE	COURSE_ID	MOBILE_NO
2	Jane Smith	28-FEB-98	F	Pokhara	Gandaki	3	8765432109
3	Bob Johnson	10-SEP-97	M	Biratnagar	Koshi	2	7654321098
7	Michael Clark	25-AUG-98	M	Butwal	Lumbini	3	3210987654
8	Sophia Turner	18-JAN-97	F	Dharan	Koshi	4	2109876543

Use of Order By

SELECT * FROM STUDENT ORDER BY COURSE_ID DESC, STUDENT_NAME ASC;

```
SQL>
SQL> SELECT * FROM STUDENT ORDER BY COURSE_ID DESC, STUDENT_NAME ASC;
```

STUDENT_ID	STUDENT_NAME	DOB	G	CITY	STATE	COURSE_ID	MOBILE_NO
5	Charlie Brown	05-JUL-99	M	Bharatpur	Bagmati	5	5432109876
10	Olivia White	08-DEC-99	F	Janakpur	Janakpur	5	0987654321
4	Alice Williams	20-NOV-96	F	Lalitpur	Bagmati	4	6543210987
8	Sophia Turner	18-JAN-97	F	Dharan	Koshi	4	2109876543
2	Jane Smith	28-FEB-98	F	Pokhara	Gandaki	3	8765432109
7	Michael Clark	25-AUG-98	M	Butwal	Lumbini	3	3210987654
3	Bob Johnson	10-SEP-97	M	Biratnagar	Koshi	2	7654321098
9	Daniel Lee	30-JUN-96	M	Nepalgunj	Mid-Western	2	1098765432
6	Eva Davis	12-MAR-94	F	Hetauda	Bagmati	1	4321098765
1	John Doe	15-MAY-95	M	Kathmandu	Bagmati	1	9876543210

10 rows selected.

Use of Group By

SELECT COURSE_ID, COUNT(*) AS student_count FROM STUDENT GROUP BY COURSE_ID;

```
SQL>
SQL> SELECT COURSE_ID, COUNT(*) AS student_count FROM STUDENT GROUP BY COURSE_ID;
```

COURSE_ID	STUDENT_COUNT
1	2
2	2
4	2
5	2
3	2

Types of Join

Inner Join

SELECT * FROM STUDENT INNER JOIN COURSE ON STUDENT.COURSE_ID = COURSE.COURSE_ID;

```
SQL>
SQL> SELECT * FROM STUDENT INNER JOIN COURSE ON STUDENT.COURSE_ID = COURSE.COURSE_ID;
rows will be truncated

rows will be truncated
```

STUDENT_ID	STUDENT_NAME	DOB	G	CITY	STATE	COURSE_ID	MOBILE_NO
1	John Doe	15-MAY-95	M	Kathmandu	Bagmati	1	9876543210
2	Jane Smith	28-FEB-98	F	Pokhara	Gandaki	3	8765432109
3	Bob Johnson	10-SEP-97	M	Biratnagar	Koshi	2	7654321098
4	Alice Williams	20-NOV-96	F	Lalitpur	Bagmati	4	6543210987
5	Charlie Brown	05-JUL-99	M	Bharatpur	Bagmati	5	5432109876
6	Eva Davis	12-MAR-94	F	Hetauda	Bagmati	1	4321098765
7	Michael Clark	25-AUG-98	M	Butwal	Lumbini	3	3210987654
8	Sophia Turner	18-JAN-97	F	Dharan	Koshi	4	2109876543
9	Daniel Lee	30-JUN-96	M	Nepalgunj	Mid-Western	2	1098765432
10	Olivia White	08-DEC-99	F	Janakpur	Janakpur	5	0987654321

10 rows selected.

Right Outer Join

SELECT * FROM STUDENT RIGHT OUTER JOIN COURSE ON STUDENT.COURSE_ID = COURSE.COURSE_ID;

```
SQL>
SQL> SELECT * FROM STUDENT RIGHT OUTER JOIN COURSE ON STUDENT.COURSE_ID = COURSE.COURSE_ID;
rows will be truncated

rows will be truncated
```

STUDENT_ID	STUDENT_NAME	DOB	G	CITY	STATE	COURSE_ID	MOBILE_NO
1	John Doe	15-MAY-95	M	Kathmandu	Bagmati	1	9876543210
2	Jane Smith	28-FEB-98	F	Pokhara	Gandaki	3	8765432109
3	Bob Johnson	10-SEP-97	M	Biratnagar	Koshi	2	7654321098
4	Alice Williams	20-NOV-96	F	Lalitpur	Bagmati	4	6543210987
5	Charlie Brown	05-JUL-99	M	Bharatpur	Bagmati	5	5432109876
6	Eva Davis	12-MAR-94	F	Hetauda	Bagmati	1	4321098765
7	Michael Clark	25-AUG-98	M	Butwal	Lumbini	3	3210987654
8	Sophia Turner	18-JAN-97	F	Dharan	Koshi	4	2109876543
9	Daniel Lee	30-JUN-96	M	Nepalgunj	Mid-Western	2	1098765432
10	Olivia White	08-DEC-99	F	Janakpur	Janakpur	5	0987654321

10 rows selected.

Left Outer Join

```
SELECT * FROM STUDENT LEFT OUTER JOIN COURSE ON STUDENT.COURSE_ID =  
COURSE.COURSE_ID;
```

```
SQL>  
SQL> SELECT * FROM STUDENT LEFT OUTER JOIN COURSE ON STUDENT.COURSE_ID = COURSE.COURSE_ID;  
rows will be truncated  
  
rows will be truncated
```

STUDENT_ID	STUDENT_NAME	DOB	G	CITY	STATE	COURSE_ID	MOBILE_NO
1	John Doe	15-MAY-95	M	Kathmandu	Bagmati	1	9876543210
6	Eva Davis	12-MAR-94	F	Hetauda	Bagmati	1	4321098765
3	Bob Johnson	10-SEP-97	M	Biratnagar	Koshi	2	7654321098
9	Daniel Lee	30-JUN-96	M	Nepalgunj	Mid-Western	2	1098765432
2	Jane Smith	28-FEB-98	F	Pokhara	Gandaki	3	8765432109
7	Michael Clark	25-AUG-98	M	Butwal	Lumbini	3	3210987654
4	Alice Williams	20-NOV-96	F	Lalitpur	Bagmati	4	6543210987
8	Sophia Turner	18-JAN-97	F	Dharan	Koshi	4	2109876543
5	Charlie Brown	05-JUL-99	M	Bharatpur	Bagmati	5	5432109876
10	Olivia White	08-DEC-99	F	Janakpur	Janakpur	5	0987654321

10 rows selected.

Full Outer Join

```
SELECT * FROM STUDENT FULL OUTER JOIN COURSE ON STUDENT.COURSE_ID =  
COURSE.COURSE_ID;
```

```
SQL>  
SQL> SELECT * FROM STUDENT FULL OUTER JOIN COURSE ON STUDENT.COURSE_ID = COURSE.COURSE_ID;  
rows will be truncated  
  
rows will be truncated
```

STUDENT_ID	STUDENT_NAME	DOB	G	CITY	STATE	COURSE_ID	MOBILE_NO
1	John Doe	15-MAY-95	M	Kathmandu	Bagmati	1	9876543210
2	Jane Smith	28-FEB-98	F	Pokhara	Gandaki	3	8765432109
3	Bob Johnson	10-SEP-97	M	Biratnagar	Koshi	2	7654321098
4	Alice Williams	20-NOV-96	F	Lalitpur	Bagmati	4	6543210987
5	Charlie Brown	05-JUL-99	M	Bharatpur	Bagmati	5	5432109876
6	Eva Davis	12-MAR-94	F	Hetauda	Bagmati	1	4321098765
7	Michael Clark	25-AUG-98	M	Butwal	Lumbini	3	3210987654
8	Sophia Turner	18-JAN-97	F	Dharan	Koshi	4	2109876543
9	Daniel Lee	30-JUN-96	M	Nepalgunj	Mid-Western	2	1098765432
10	Olivia White	08-DEC-99	F	Janakpur	Janakpur	5	0987654321

10 rows selected.