EDUCATIONAL COURSE DETAILS

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ABSTRACT :

This project presents a structured SQL database designed to manage and maintain detailed educational course information within an academic institution. The database schema encompasses four key entities: Courses, Departments, Course Levels, and Course Types, which collectively facilitate efficient organization and retrieval of course-related data.

1. Courses Table

The courses table is central to the schema, containing essential information about each course, such as its name, code, type, associated department, URL, and level. This table allows for the differentiation between core and elective courses, as well as the categorization of courses by their academic levels (Undergraduate, Postgraduate).

2. Course Levels Table

The course_level table defines the academic levels of the courses, providing clarity on the intended audience (e.g., undergraduate or postgraduate). This classification aids in advising students and organizing course offerings.

3. Course Types Table

The course_type table categorizes courses into core and elective types. This classification is critical for curriculum design, enabling academic departments to balance mandatory courses with optional ones, thus allowing students to tailor their education.

4. Department Table

The department table contains information about various academic departments within the institution. Each department is linked to its courses, facilitating the management of course offerings and departmental responsibilities.

Overall, this SQL database project serves as a robust framework for educational course management, enhancing administrative efficiency and supporting informed decision-making within academic institutions. Future enhancements may include integrating student enrollment data and performance metrics to further enrich the database's functionality.

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PROJECT FOR SQL MODULE

Objective:

The objective of this project is to create a structured SQL database system that efficiently manages educational course information within an academic institution. This system aims to track courses, departments, course levels, and course types, providing a comprehensive framework for academic administration.

Components:

- **Courses Table**: This table stores detailed information about individual courses, including their ID, name, course code, type, associated department, URL, and academic level. It allows for the differentiation between core and elective courses, as well as the categorization of courses by their intended audience (Undergraduate or Postgraduate).
- **Departments Table**: This table contains information about various academic departments within the institution. Each department is linked to its respective courses, facilitating the management of course offerings and departmental responsibilities.
- **Course Levels Table**: This table defines the academic levels of the courses, clarifying the intended audience. It aids in advising students and organizing course offerings, ensuring alignment with educational objectives.
- **Course Types Table**: This table categorizes courses into core and elective types. This classification is critical for curriculum design, enabling departments to balance mandatory courses with optional ones, allowing students to tailor their educational paths.

Functionality:

- The database facilitates the management of educational courses, including the creation, updating, and monitoring of course offerings.
- It enables the categorization and analysis of courses based on key attributes such as type, level, and department, assisting academic advisors and faculty in decision-making.
- Departments can be associated with multiple courses, and courses can fall under different types and levels, enhancing flexibility in course management.

Analysis and Reporting:

- The database supports reporting and analysis features to generate insights into course offerings, departmental performance, and student engagement.
- Academic administrators can assess the diversity of courses based on metrics such as course types and levels, helping to identify gaps and opportunities in the curriculum.
- Data can be aggregated to track trends in course popularity and student enrollment, informing future course development and resource allocation.

ER DIAGRAM FOR EDUCATIONAL COURSE DETAILS

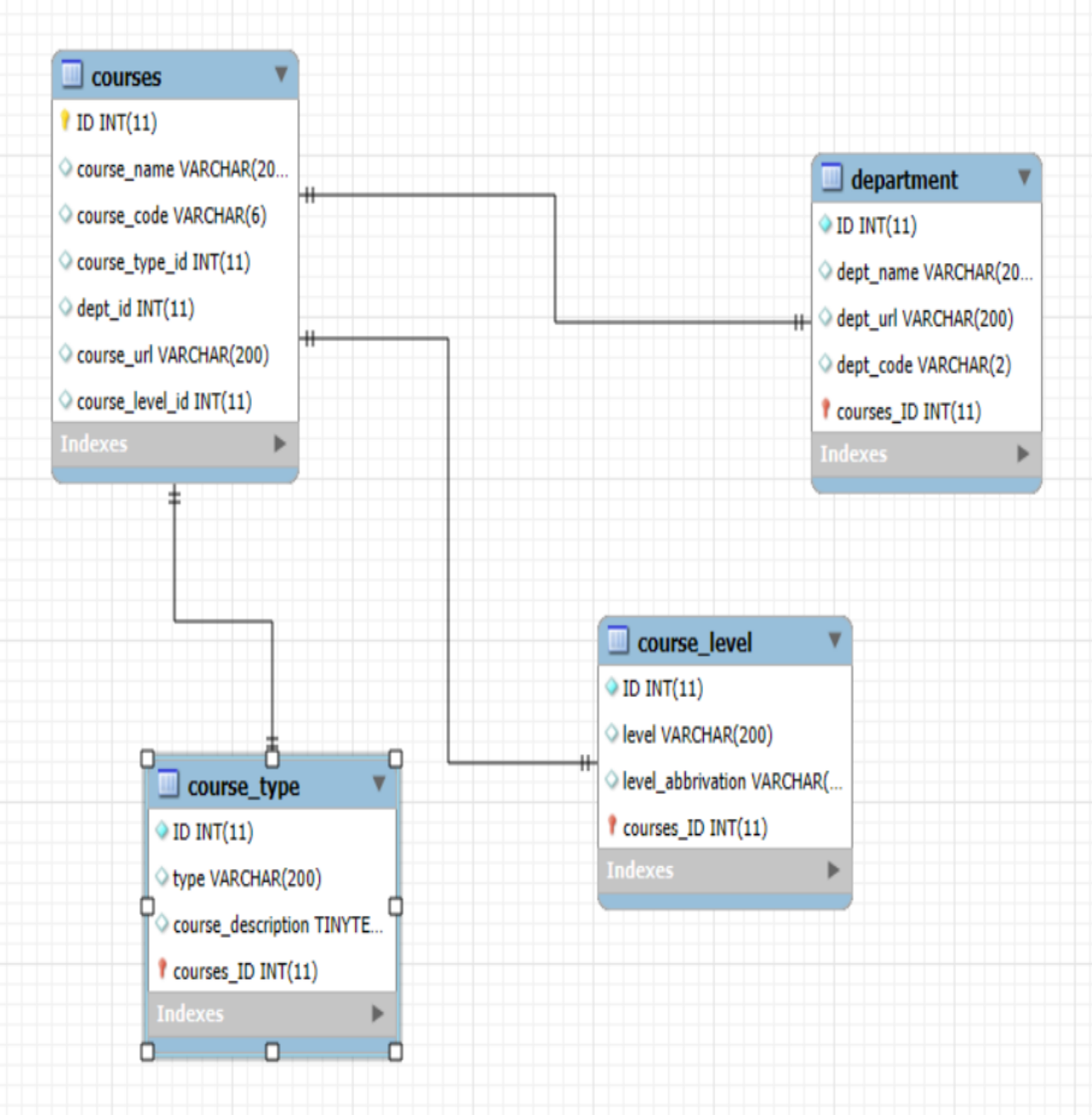


TABLE DISCRIPTIONS

1. COURSES

Field	Type	Null	Key	Default	Extra
ID	int(11)	NO		NULL	
course_name	varchar(200)	YES		NULL	
course_code	varchar(6)	YES		NULL	
course_type_id	int(11)	YES		NULL	
dept_id	int(11)	YES		NULL	
course_url	varchar(200)	YES		NULL	
course_level_id	int(11)	YES		NULL	

2. COURSE LEVEL

Field	Type	Null	Key	Default	Extra
ID	int(11)	NO		NULL	
level	varchar(200)	YES		NULL	
level_abbrivation	varchar(6)	YES		NULL	

3. COURSE TYPE

Field	Type	Null	Key	Default	Extra
ID	int(11)	NO		NULL	
type	varchar(200)	YES		NULL	
course_description	tinytext	YES		NULL	

4. DEPARTMENT

Field	Type	Null	Key	Default	Extra
ID	int(11)	NO		NULL	
dept_name	varchar(200)	YES		NULL	
dept_url	varchar(200)	YES		NULL	
dept_code	varchar(2)	YES		NULL	

COMMANDS

- **CREATE DATABASE**

```
create database project;
use project;
```

- **CREATE THE COURSE TABLE**

```
CREATE TABLE courses(
  `ID` int(11) NOT NULL,
  `course_name` varchar(200) DEFAULT NULL,
  `course_code` varchar(6) DEFAULT NULL,
  `course_type_id` int(11) DEFAULT NULL,
  `dept_id` int(11) DEFAULT NULL,
  `course_url` varchar(200) DEFAULT NULL,
  `course_level_id` int(11) DEFAULT NULL
);
```

- **CREATE THE COURSE LEVEL TABLE**

```
CREATE TABLE course_level(
  `ID` int(11) NOT NULL,
  `level` varchar(200) DEFAULT NULL,
  `level_abbrivation` varchar(6) DEFAULT NULL
) ;
```

- **CREATE THE COURSE TYPE TABLE**

```
CREATE TABLE course_type(
`ID` int(11) NOT NULL,
  `type` varchar(200) DEFAULT NULL,
  `course_description` tinytext
);
```

- **CREATE THE DEPARTMENT TABLE**

```
CREATE TABLE department(
`ID` int(11) NOT NULL,
 `dept_name` varchar(200) DEFAULT NULL,
 `dept_url` varchar(200) DEFAULT NULL,
 `dept_code` varchar(2) DEFAULT NULL);
```

- **INSERT VALUES FOR COURSE TABLE**

```
INSERT INTO `courses` (`ID`, `course_name`, `course_code`, `course_type_id`, `dept_id`, `course_url`, `course_level_id`) VALUES
(1, 'Fluid Mechanics- Civil', 'CE223', 2, 1, 'https://portal.iitb.ac.in/asc/Courses/', 1),
(2, 'Structural Dynamics ', 'CE616', 2, 1, 'https://portal.iitb.ac.in/asc/Courses', 2),
(3, 'Discrete Structures', 'CS207', 2, 2, 'https://www.cse.iitb.ac.in/~akshayss/courses/cs207-2016.html ', 1),
(4, 'Linear Algebra', 'MA106', 2, 6, 'https://portal.iitb.ac.in/asc/Courses/', 1),
(5, 'Transport Phenomena', 'MM659', 2, 8, 'https://portal.iitb.ac.in/asc/Courses', 2),
(6, 'Data analysis and Interpretation', 'MM217', 2, 8, 'https://portal.iitb.ac.in/asc/Courses', 1),
(7, 'Thermodynamics', 'ME209', 2, 7, 'https://portal.iitb.ac.in/asc/Courses', 1),
(8, 'Solid Mechanics', 'CE221', 2, 1, 'https://portal.iitb.ac.in/asc/Courses', 1),
(9, 'Complex Analysis', 'MA205', 2, 6, 'https://portal.iitb.ac.in/asc/Courses/', 1),
(10, 'Thermodynamics and Propulsion', 'AE223', 2, 3, 'https://iitbaero.github.io/second%20year%20courses/Thermodynamics-and-Propulsion/ ', 1),
(11, 'Machine Learning Based Uncertainty Quantification for Composites', 'AE669', 1, 3, '', 2),
(12, 'Introduction to Special Theory of Relativity', 'PH207', 2, 9, 'https://portal.iitb.ac.in/asc/Courses', 1),
(13, 'Fluid  Mechanics', 'ME219', 2, 7, 'https://portal.iitb.ac.in/asc/Courses', 1),
(14, 'Analog Circuits', 'EE204', 2, 5, 'https://www.ee.iitb.ac.in/web/academics/courses/EE204  ', 1),
(15, 'Geotechnical Engg.-1', 'CE323', 2, 1, 'https://portal.iitb.ac.in/asc/Courses', 1),
```

(16, 'Environmental Geotechnics', 'CE641', 2, 1, 'https://portal.iitb.ac.in/asc/Courses', 1),

(17, 'Quantum Mechanics 1', 'PH204', 2, 9, 'https://nptel.ac.in/courses/115/101/115101107/ ', 1),

(18, 'Basic Number Theory ', 'MA523', 1, 6, 'https://portal.iitb.ac.in/asc/Courses', 1),

(19, 'Optimization in Civil Engineering', 'CE771', 1, 1, 'https://portal.iitb.ac.in/asc/Courses', 2),

(20, 'Fiber Reinforced Composites', 'AE673', 1, 3, 'https://portal.iitb.ac.in/asc/Courses', 2),

(21, 'Foundations of Intelligent and Learning Agents', 'CS747', 1, 2, 'https://www.cse.iitb.ac.in/~shivaram/teaching/old/cs747-a2020/index.html', 2),

(22, 'Water Resources Engineering', 'CE401', 2, 1, 'https://portal.iitb.ac.in/asc/Courses', 1),

(23, 'Design Lab I', 'CL455', 2, 4, 'https://portal.iitb.ac.in/asc/Courses', 1),

(24, 'Microwave Integrated Circuits', 'EE611', 1, 5, 'https://www.ee.iitb.ac.in/web/academics/courses/EE611', 2),

(25, 'Digital Signal Processing', 'EE338', 2, 5, 'https://www.ee.iitb.ac.in/web/academics/courses/EE338', 1),

(26, 'Group Theory Methods', 'PH563', 2, 9, 'https://nptel.ac.in/courses/115/101/115101122/', 1),

(28, 'Speech and Natural Language Processing and The Web', 'CS626', 2, 2, 'https://www.cse.iitb.ac.in/~cs626-449/', 1),

(29, 'Sustainable Engineering Principles', 'CL665', 1, 4, 'https://www.che.iitb.ac.in/web/faculty/yshastri/webpage/SEP%20-%20Course%20Outline%20-%20May%202015.pdf', 1),

(30, 'Thermal Physics', 'PH215', 2, 9, 'https://portal.iitb.ac.in/asc/Courses', 1),

(31, 'Data Analysis and Interpretation-Physics', 'PH219', 2, 9, 'https://portal.iitb.ac.in/asc/Courses', 1),

(32, 'Advances in Intelligent and Learning Agents', 'CS748', 1, 2, 'https://www.cse.iitb.ac.in/~shivaram/teaching/cs748-s2021/index.html', 2),

(33, 'Geometric Design and Analysis of High-Speed Roadways', 'CE773', 2, 1, '', 2),

(34, 'Power Engineering', 'EE114', 2, 5, '', 1),

(35, 'Introduction to Machine Learning', 'EE769', 2, 5, 'https://www.ee.iitb.ac.in/web/academics/courses/EE769', 2),

(36, 'Diffusion and Kinetics', 'MM677', 2, 8, '', 2),

(37, 'Organization Behavior and Human Resources II', 'SOM618', 2, 10, '', 2),

(38, 'Finite Fields and their Applications', 'EE649', 1, 5,
'https://portal.iitb.ac.in/asc/Courses/crsedetail.jsp?ccd=EE%20649', 2),

(39, 'Control Systems', 'EE302', 2, 5,
'https://portal.iitb.ac.in/asc/Courses/crsedetail.jsp?ccd=EE%20302', 1),

(40, 'Signal Processing for Geosciences', 'GP503', 2, 11, '', 2),

(41, 'Logic in Computer Science', 'CS228', 2, 2, '', 1),

(42, 'Nonlinear Dynamical Systems', 'EE613', 1, 5, '', 1),

(43, 'Markov Chains and the Theory of Queues', 'EE621', 1, 5,
'https://portal.iitb.ac.in/asc/Courses/crsedetail.jsp?ccd=EE%20621', 1),

(44, 'Robust Control', 'EE6111', 1, 5, '', 1),

(45, 'Communication and Interpersonal Skill', 'SOM601', 2, 10,
'https://portal.iitb.ac.in/asc/Courses/crsedetail.jsp?ccd=SOM601', 2),

(46, 'Electronic Devices and Circuits', 'EE207', 1, 5,
'https://www.ee.iitb.ac.in/web/academics/courses/EE207', 1),

(47, 'Structural Materials', 'ME221', 1, 7, '', 1);

- **INSERT VALUE FOR COURSE LEVEL TABLE**

INSERT INTO `course_level` (`ID`, `level`, `level_abbrivation`) VALUES

(1, 'Under Graduate', 'UG'),

(2, 'Post Graduation', 'PG'),

(3, 'UG/PG', 'UG/PG');

- **INSERT VALUE FOR COURSE TYPE TABLE**

INSERT INTO `course_type` (`ID`, `type`, `course_description`) VALUES

(1, 'Elective', 'Elective'),

(2, 'Core', 'Core');

- **INSERT VALUE FOR DEPARTMENT TABLE**

```
INSERT INTO `department` (`ID`, `dept_name`, `dept_url`, `dept_code`) VALUES
(1, 'Civil Engineering', 'https://www.civil.iitb.ac.in/', 'CE'),
(2, 'Computer Science and Engineering', 'https://www.cse.iitb.ac.in/', 'CS'),
(3, 'Aerospace Engineering', 'https://www.aero.iitb.ac.in/home/', 'AE'),
(4, 'Chemical Engineering', 'https://www.che.iitb.ac.in/', 'CL'),
(5, 'Electrical Engineering', 'https://www.ee.iitb.ac.in/web', 'EE'),
(6, 'Mathematics', 'http://www.math.iitb.ac.in/', 'MA'),
(7, 'Mechanical Engineering', 'https://www.me.iitb.ac.in/', 'ME'),
(8, 'Metallurgical Engineering and Materials Science', 'http://www.iitb.ac.in/mems/en', 'MM'),
(9, 'Physics', 'http://www.phy.iitb.ac.in/', 'PH'),
(10, 'Shailesh J. Mehta School of Management', 'https://www.som.iitb.ac.in/', 'SO'),
(11, 'Department of Earth Sciences', 'https://www.geos.iitb.ac.in/', 'GP'),
(12, 'Centre of Studies in Resources Engineering', 'https://www.csre.iitb.ac.in/', 'RE'),
(13, 'IDC School of Design', 'https://www.idc.iitb.ac.in/', 'ID'),
(14, 'Other', '', 'OT'),
(15, 'Systems and Control Engineering', 'https://www.sc.iitb.ac.in/', 'SC'),
(16, 'Environmental Science and Engineering', 'https://www.esed.iitb.ac.in/', 'ES'),
(17, 'Chemistry Department', 'https://www.chem.iitb.ac.in/', 'CH');
```

QUERIES

- **BASIC QUERIES:**

1. FIND TOTAL NUMBER OF COURSES
   QUERY:
   ```
   select count(course_name) as TOTAL_COURSES from courses;
   ```

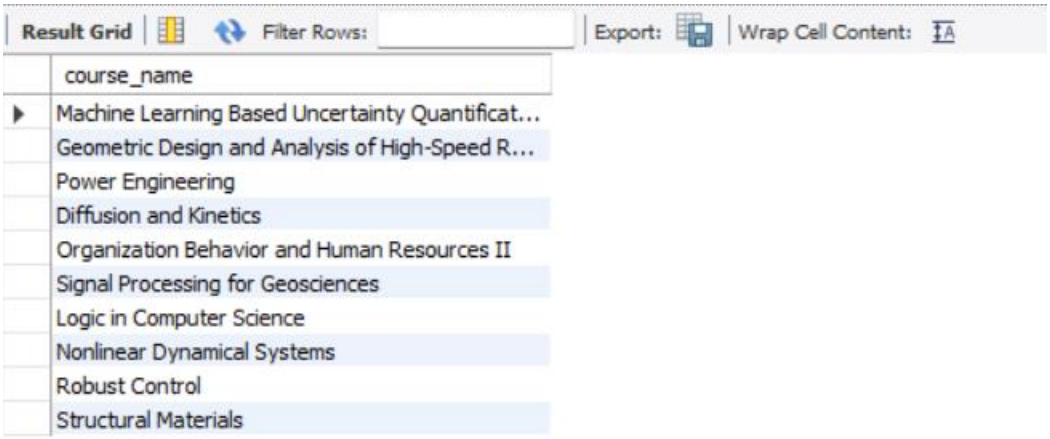
   RESULT:

   
   Result Grid | Filter Rows: | Export: | Wrap Cell Content:

TOTAL_COURSES
46

2. LIST ALL COURSES THAT HAVE NO URL ASSOCIATED WITH THEM
   QUERY:
   ```
   SELECT course_name
   FROM courses
   WHERE course_url IS NULL OR course_url = '';
   ```

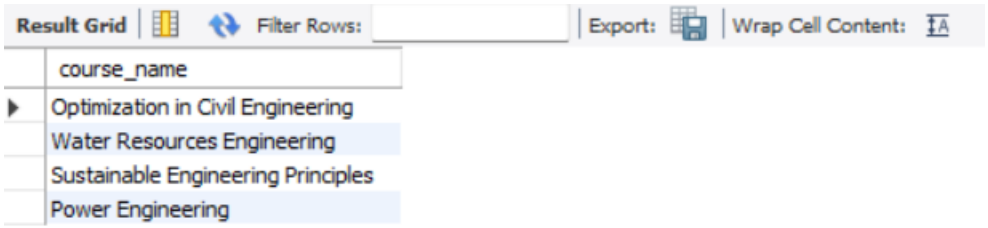
   RESULT:

   
   Result Grid | Filter Rows: | Export: | Wrap Cell Content:

course_name
Machine Learning Based Uncertainty Quantificat...
Geometric Design and Analysis of High-Speed R...
Power Engineering
Diffusion and Kinetics
Organization Behavior and Human Resources II
Signal Processing for Geosciences
Logic in Computer Science
Nonlinear Dynamical Systems
Robust Control
Structural Materials

3. FIND ALL COURSES WITH “ENGINEERING” IN THEIR NAME
   QUERY:
   ```
   SELECT course_name
   FROM courses
   WHERE course_name LIKE '%Engineering%';
   ```

RESULT:



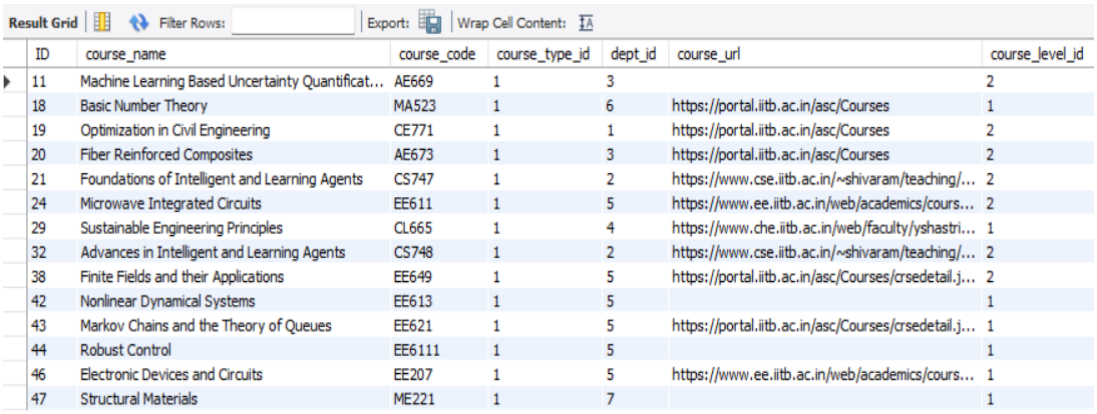
course_name
Optimization in Civil Engineering
Water Resources Engineering
Sustainable Engineering Principles
Power Engineering

4. SELECT COURSES WITH A SPECIFIC COURSE TYPE

QUERY:

```
SELECT * FROM courses WHERE course_type_id = 1;
```

RESULT:



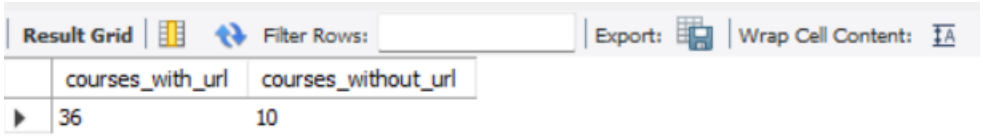
ID	course_name	course_code	course_type_id	dept_id	course_url	course_level_id
11	Machine Learning Based Uncertainty Quantificat...	AE669	1	3		2
18	Basic Number Theory	MA523	1	6	https://portal.iitb.ac.in/asc/Courses	1
19	Optimization in Civil Engineering	CE771	1	1	https://portal.iitb.ac.in/asc/Courses	2
20	Fiber Reinforced Composites	AE673	1	3	https://portal.iitb.ac.in/asc/Courses	2
21	Foundations of Intelligent and Learning Agents	CS747	1	2	https://www.cse.iitb.ac.in/~shivaram/teaching/...	2
24	Microwave Integrated Circuits	EE611	1	5	https://www.ee.iitb.ac.in/web/academics/cours...	2
29	Sustainable Engineering Principles	CL665	1	4	https://www.che.iitb.ac.in/web/faculty/yshastri...	1
32	Advances in Intelligent and Learning Agents	CS748	1	2	https://www.cse.iitb.ac.in/~shivaram/teaching/...	2
38	Finite Fields and their Applications	EE649	1	5	https://portal.iitb.ac.in/asc/Courses/crsedetail.j...	2
42	Nonlinear Dynamical Systems	EE613	1	5		1
43	Markov Chains and the Theory of Queues	EE621	1	5	https://portal.iitb.ac.in/asc/Courses/crsedetail.j...	1
44	Robust Control	EE6111	1	5		1
46	Electronic Devices and Circuits	EE207	1	5	https://www.ee.iitb.ac.in/web/academics/cours...	1
47	Structural Materials	ME221	1	7		1

5. COUNT COURSES WITH URL VS WITHOUT URL

QUERY:

```
SELECT
   SUM(CASE WHEN course_url IS NOT NULL AND course_url <> '' THEN 1 ELSE 0 END) AS courses_with_url,
   SUM(CASE WHEN course_url IS NULL OR course_url = '' THEN 1 ELSE 0 END) AS courses_without_url
FROM courses;
```

RESULT:



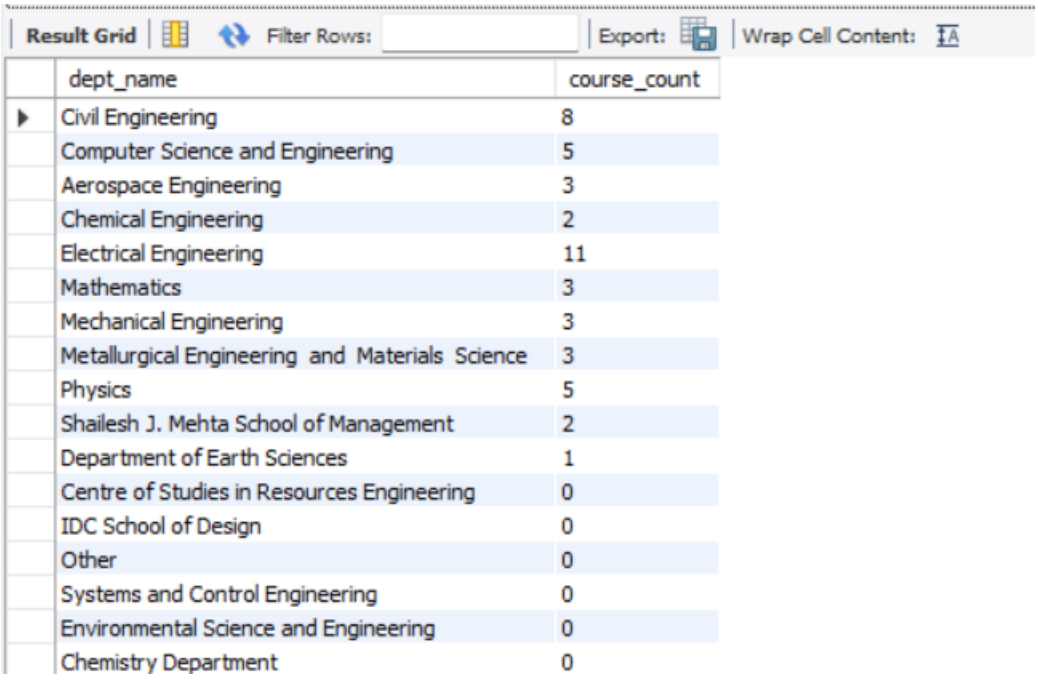
courses_with_url	courses_without_url
36	10

- **SUB QUERIES**

6. FIND THE COUNT OF COURSES PER DEPARTMENT
   QUERY:

```
SELECT d.dept_name,
    (SELECT COUNT(*) FROM courses WHERE dept_id = d.ID) AS course_count
FROM department d;
```

   RESULT:

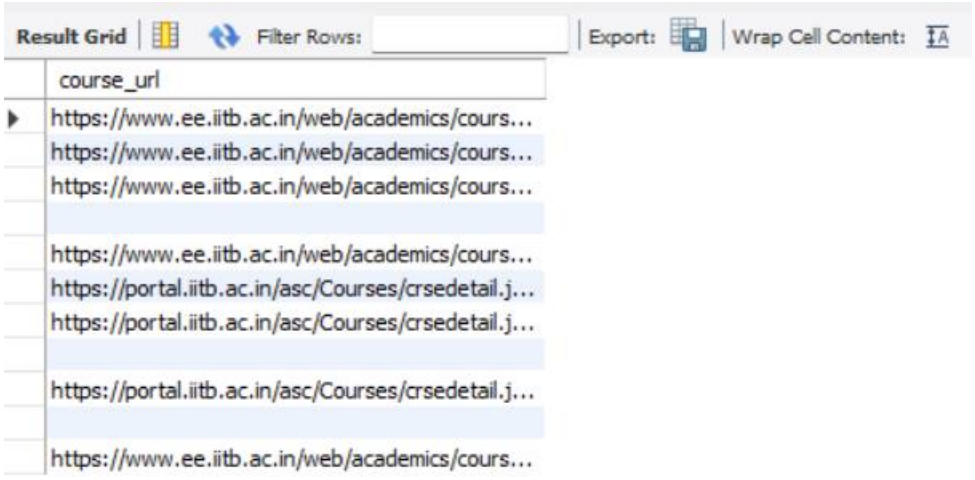


dept_name	course_count
Civil Engineering	8
Computer Science and Engineering	5
Aerospace Engineering	3
Chemical Engineering	2
Electrical Engineering	11
Mathematics	3
Mechanical Engineering	3
Metallurgical Engineering and Materials Science	3
Physics	5
Shailesh J. Mehta School of Management	2
Department of Earth Sciences	1
Centre of Studies in Resources Engineering	0
IDC School of Design	0
Other	0
Systems and Control Engineering	0
Environmental Science and Engineering	0
Chemistry Department	0

7. GET THE URLS OF COURSES TAUGHT BY THE “ELECTRICAL ENGINEERING” DEPARTMENT.
   QUERY:

```
SELECT course_url
FROM courses
WHERE dept_id = (SELECT ID FROM department WHERE dept_name = 'Electrical
Engineering');
```

RESULT:



course_url
https://www.ee.iitb.ac.in/web/academics/cours...
https://www.ee.iitb.ac.in/web/academics/cours...
https://www.ee.iitb.ac.in/web/academics/cours...
https://www.ee.iitb.ac.in/web/academics/cours...
https://portal.iitb.ac.in/asc/Courses/crsedetail.j...
https://portal.iitb.ac.in/asc/Courses/crsedetail.j...
https://portal.iitb.ac.in/asc/Courses/crsedetail.j...
https://www.ee.iitb.ac.in/web/academics/cours...

8. LIST ALL COURSES AT THE "POST GRADUATION" LEVEL.

QUERY:

```
SELECT *
FROM courses
WHERE course_level_id = (SELECT ID FROM course_level WHERE level = 'Post Graduation');
```

RESULT:

ID	course_name	course_code	course_type_id	dept_id	course_url	course_level_id
2	Structural Dynamics	CE616	2	1	https://portal.iitb.ac.in/asc/Courses	2
5	Transport Phenomena	MM659	2	8	https://portal.iitb.ac.in/asc/Courses	2
11	Machine Learning Based Uncertainty Quantificat...	AE669	1	3		2
19	Optimization in Civil Engineering	CE771	1	1	https://portal.iitb.ac.in/asc/Courses	2
20	Fiber Reinforced Composites	AE673	1	3	https://portal.iitb.ac.in/asc/Courses	2
21	Foundations of Intelligent and Learning Agents	CS747	1	2	https://www.cse.iitb.ac.in/~shivaram/teaching/...	2
24	Microwave Integrated Circuits	EE611	1	5	https://www.ee.iitb.ac.in/web/academics/cours...	2
32	Advances in Intelligent and Learning Agents	CS748	1	2	https://www.cse.iitb.ac.in/~shivaram/teaching/...	2
33	Geometric Design and Analysis of High-Speed R...	CE773	2	1		2
35	Introduction to Machine Learning	EE769	2	5	https://www.ee.iitb.ac.in/web/academics/cours...	2
36	Diffusion and Kinetics	MM677	2	8		2
37	Organization Behavior and Human Resources II	SOM618	2	10		2
38	Finite Fields and their Applications	EE649	1	5	https://portal.iitb.ac.in/asc/Courses/crsedetail.j...	2
40	Signal Processing for Geosciences	GP503	2	11		2
45	Communication and Interpersonal Skill	SOM601	2	10	https://portal.iitb.ac.in/asc/Courses/crsedetail.j...	2

9. DEPARTMENTS OFFERING MORE THAN 5 COURSES

QUERY:

```
SELECT dept_name
FROM department
WHERE ID IN (SELECT dept_id FROM courses GROUP BY dept_id HAVING COUNT(*) > 5);
```

RESULT:

dept_name
Civil Engineering
Electrical Engineering

10. COURSE NAMES WITH MINIMUM COURSE LEVEL

QUERY:

```
SELECT course_name
FROM courses
WHERE course_level_id = (SELECT MIN(ID) FROM course_level);
```

RESULT:

course_name
Fluid Mechanics- Civil
Discrete Structures
Linear Algebra
Data analysis and Interpretation
Thermodynamics
Solid Mechanics
Complex Analysis
Thermodynamics and Propulsion
Introduction to Special Theory of Relativity
Fluid Mechanics
Analog Circuits
Geotechnical Engg.-1
Environmental Geotechnics
Quantum Mechanics 1
Basic Number Theory
Water Resources Engineering
Design Lab I
Digital Signal Processing
Group Theory Methods
Speech and Natural Language Processing ...
Sustainable Engineering Principles
Thermal Physics
Data Analysis and Interpretation-Physics
Power Engineering

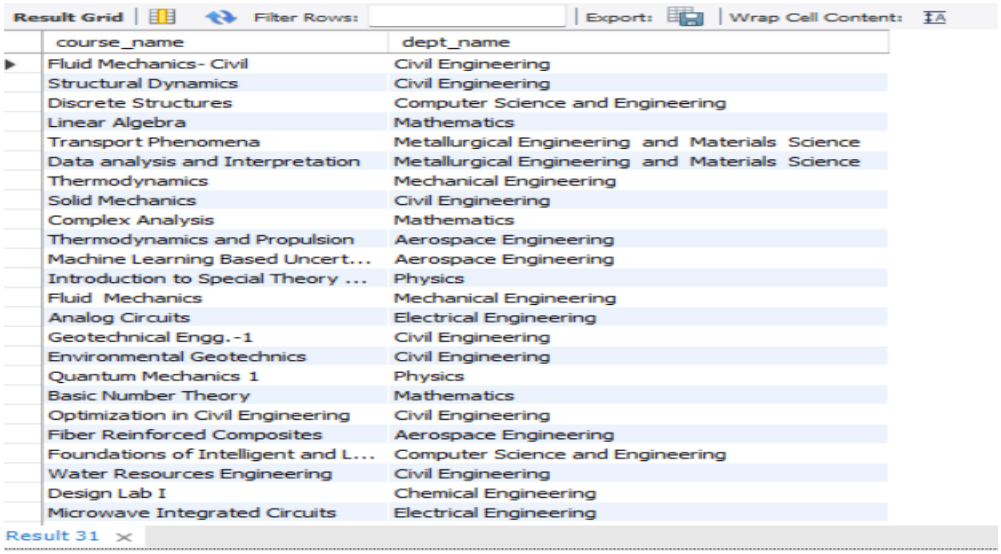
- **JOINS**

11. SELECT ALL COURSES WITH THEIR DEPARTMENT NAMES.

QUERY:

```
SELECT c.course_name, d.dept_name
FROM courses c
JOIN department d ON c.dept_id = d.ID;
```

RESULT:



Result Grid | Filter Rows: | Export: | Wrap Cell Content:

course_name	dept_name
Fluid Mechanics- Civil	Civil Engineering
Structural Dynamics	Civil Engineering
Discrete Structures	Computer Science and Engineering
Linear Algebra	Mathematics
Transport Phenomena	Metallurgical Engineering and Materials Science
Data analysis and Interpretation	Metallurgical Engineering and Materials Science
Thermodynamics	Mechanical Engineering
Solid Mechanics	Civil Engineering
Complex Analysis	Mathematics
Thermodynamics and Propulsion	Aerospace Engineering
Machine Learning Based Uncert...	Aerospace Engineering
Introduction to Special Theory ...	Physics
Fluid Mechanics	Mechanical Engineering
Analog Circuits	Electrical Engineering
Geotechnical Engg.-1	Civil Engineering
Environmental Geotechnics	Civil Engineering
Quantum Mechanics 1	Physics
Basic Number Theory	Mathematics
Optimization in Civil Engineering	Civil Engineering
Fiber Reinforced Composites	Aerospace Engineering
Foundations of Intelligent and L...	Computer Science and Engineering
Water Resources Engineering	Civil Engineering
Design Lab I	Chemical Engineering
Microwave Integrated Circuits	Electrical Engineering

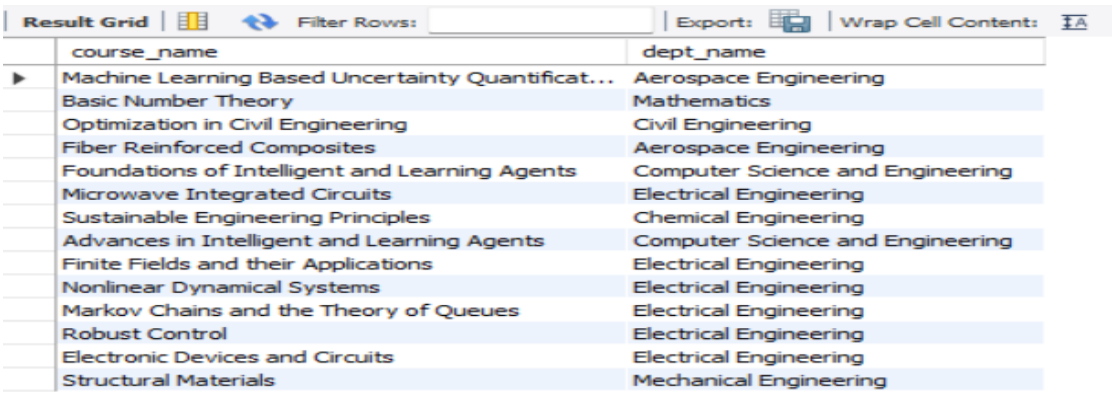
Result 31

12. GET ELECTIVE COURSES WITH THEIR DEPARTMENT NAMES

QUERY:

```
SELECT c.course_name, d.dept_name
FROM courses c
JOIN department d ON c.dept_id = d.ID
WHERE c.course_type_id = 1;
```

RESULT:



Result Grid | Filter Rows: | Export: | Wrap Cell Content:

course_name	dept_name
Machine Learning Based Uncertainty Quantificat...	Aerospace Engineering
Basic Number Theory	Mathematics
Optimization in Civil Engineering	Civil Engineering
Fiber Reinforced Composites	Aerospace Engineering
Foundations of Intelligent and Learning Agents	Computer Science and Engineering
Microwave Integrated Circuits	Electrical Engineering
Sustainable Engineering Principles	Chemical Engineering
Advances in Intelligent and Learning Agents	Computer Science and Engineering
Finite Fields and their Applications	Electrical Engineering
Nonlinear Dynamical Systems	Electrical Engineering
Markov Chains and the Theory of Queues	Electrical Engineering
Robust Control	Electrical Engineering
Electronic Devices and Circuits	Electrical Engineering
Structural Materials	Mechanical Engineering

13. LIST DEPARTMENTS AND THE MAXIMUM COURSE LEVEL OFFERED

QUERY:

```
SELECT d.dept_name, MAX(c.course_level_id) AS max_level
FROM department d
LEFT JOIN courses c ON d.ID = c.dept_id
GROUP BY d.dept_name;
```

RESULT:

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

dept_name	max_level
Aerospace Engineering	2
Centre of Studies in Resources Engineering	NULL
Chemical Engineering	1
Chemistry Department	NULL
Civil Engineering	2
Computer Science and Engineering	2
Department of Earth Sciences	2
Electrical Engineering	2
Environmental Science and Engineering	NULL
IDC School of Design	NULL
Mathematics	1
Mechanical Engineering	1
Metallurgical Engineering and Materials S...	2
Other	NULL
Physics	1
Shailesh J. Mehta School of Management	2
Systems and Control Engineering	NULL

14. SHOW ALL DEPARTMENTS WITH COURSES, EVEN IF SOME DEPARTMENTS HAVE NO COURSES

QUERY:

```
SELECT d.dept_name, c.course_name
FROM department d
RIGHT JOIN courses c ON d.ID = c.dept_id;
```

RESULT:

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

dept_name	course_name
Civil Engineering	Fluid Mechanics- Civil
Civil Engineering	Structural Dynamics
Civil Engineering	Solid Mechanics
Civil Engineering	Geotechnical Engg.-1
Civil Engineering	Environmental Geotechnics
Civil Engineering	Optimization in Civil Engineering
Civil Engineering	Water Resources Engineering
Civil Engineering	Geometric Design and Analysis of High-Speed R...
Computer Science and Engineering	Discrete Structures
Computer Science and Engineering	Foundations of Intelligent and Learning Agents
Computer Science and Engineering	Speech and Natural Language Processing and T...
Computer Science and Engineering	Advances in Intelligent and Learning Agents
Computer Science and Engineering	Logic in Computer Science
Aerospace Engineering	Thermodynamics and Propulsion
Aerospace Engineering	Machine Learning Based Uncertainty Quantificat...
Aerospace Engineering	Fiber Reinforced Composites
Chemical Engineering	Design Lab I
Chemical Engineering	Sustainable Engineering Principles
Electrical Engineering	Analog Circuits
Electrical Engineering	Microwave Integrated Circuits
Electrical Engineering	Digital Signal Processing
Electrical Engineering	Power Engineering
Electrical Engineering	Introduction to Machine Learning
Electrical Engineering	Finite Fields and their Applications

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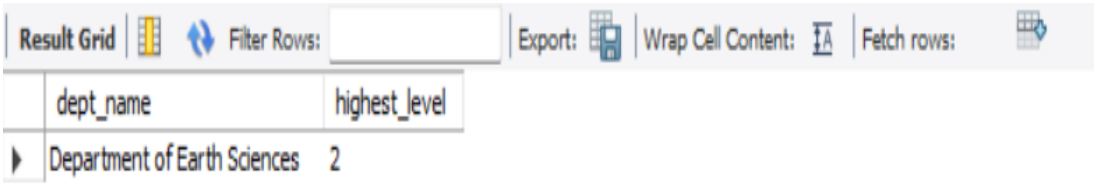
15. DEPARTMENTS OFFERING THE MOST ADVANCED COURSES (HIGHEST COURSE LEVEL)

QUERY:

```
SELECT d.dept_name, MAX(c.course_level_id) AS highest_level
FROM department d
JOIN courses c ON d.ID = c.dept_id
GROUP BY d.dept_name
ORDER BY highest_level DESC
LIMIT 1;
```

RESULT:



dept_name	highest_level
Department of Earth Sciences	2

Conclusion

The SQL database project for educational course management presents a robust and efficient system for organizing and maintaining critical information related to courses, departments, course levels, and course types. By implementing a structured schema, the database facilitates the seamless management of academic offerings, enabling institutions to cater effectively to the diverse needs of students and faculty.

This project enhances academic administration by providing essential functionalities, such as the ability to create, update, and monitor courses, as well as categorize them by type and level. The relationships established among the tables ensure clarity and accessibility of information, fostering informed decision-making and strategic planning within the institution.

Moreover, the analytical capabilities of the database allow for insightful reporting on course offerings and departmental performance. By tracking metrics related to course types and levels, academic administrators can identify trends and gaps in the curriculum, ultimately leading to the optimization of educational programs.

In summary, this SQL database serves as a vital tool for academic institutions, promoting effective course management and contributing to an enriched educational experience for students. Future enhancements could include integrating student enrollment data and performance metrics, further expanding the database's functionality and impact on academic success.