Phase-01

Description:

The ***Advanced E-Learning System*** is a comprehensive platform designed to streamline online education. It allows students to enroll in a variety of courses across different levels, with personalized learning modules and interactive lessons. Instructors can easily create and manage courses, track student progress, and provide feedback, while administrators oversee the entire learning environment. With support for quizzes, video content, and a multi-language interface, this system offers a dynamic and engaging educational experience for both students and educators.

-- showcase data population

```
select * from assessment;
select * from assignments;
select * from badges;
select * from category;
select * from certificate;
select * from courses;
select * from discussionforum;
select * from enroll;
select * from lessons;
select * from modules;
select * from notifications;
select * from payments;
select * from quiz;
select * from reviews;
select * from submissions;
select * from users;
```

Relationships

1. Users

- **Relation**: "Instructs" / "Enrolls" / "Posts" / "Pays" / "Reviews"
- **Cardinalities**:
    - **One-to-Many** with courses (Instructs): One user (instructor) can teach many courses.
    - **One-to-Many** with enroll (Enrolls): One user (student) can enroll in many courses.
    - **One-to-Many** with discussion (Posts): One user can post in many discussions.
    - **One-to-Many** with payments (Pays): One user can make many payments.
    - **One-to-Many** with reviews (Reviews): One user can write many reviews.
    - **One-to-Many** with badges: One user can receive many badges.
    - **One-to-Many** with certificates: One user can earn many certificates.
    - **One-to-Many** with notifications: One user can receive many notifications.
    - **One-to-Many** with submissions: One user (student) can submit many assignments or assessments.

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2. Courses

- **Relation**: "Contains" / "Is Reviewed By" / "Is Paid For" / "Certifies"
- **Cardinalities**:
    - **One-to-Many** with modules (Contains): One course can contain many modules.
    - **One-to-Many** with enroll (Is Enrolled By): One course can have many students enrolled.
    - **One-to-Many** with reviews (Is Reviewed By): One course can have many reviews.
    - **One-to-Many** with payments (Is Paid For): One course can have many payments.
    - **One-to-Many** with certificates (Certifies): One course can issue many certificates.
    - **One-to-Many** with discussion: One course can have many discussion threads.

---

3. Modules

- **Relation**: "Contains" / "Belongs To"

- **Cardinalities**:
    - **One-to-Many** with lessons (Contains): One module can contain many lessons.
    - **Many-to-One** with courses (Belongs To): Many modules belong to one course.

---

4. Lessons

- **Relation**: "Contains" / "Belongs To"
- **Cardinalities**:
    - **One-to-Many** with assignments (Contains): One lesson can contain many assignments.
    - **One-to-Many** with quiz (Contains): One lesson can contain many quizzes.
    - **One-to-Many** with assessment (Contains): One lesson can contain many assessments.
    - **Many-to-One** with modules (Belongs To): Many lessons belong to one module.

---

5. Enroll

- **Relation**: "Enrolls In" / "Enrolls Students In"
- **Cardinalities**:
    - **Many-to-One** with users (Enrolls In): Many enrollments are made by one user (student).
    - **Many-to-One** with courses (Enrolls Students In): Many enrollments are made in one course.

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6. Reviews

- **Relation**: "Reviewed By" / "Reviews"
- **Cardinalities**:
    - **Many-to-One** with users (Reviewed By): Many reviews are written by one user (student).
    - **Many-to-One** with courses (Reviews): Many reviews belong to one course.

---

7. Assignments

- **Relation**: "Submitted For" / "Belongs To"

- **Cardinalities**:
    - **One-to-Many** with submissions (Submitted For): One assignment can have many submissions.
    - **Many-to-One** with lessons (Belongs To): Many assignments belong to one lesson.

---

8. Quiz

- **Relation**: "Belongs To"
- **Cardinalities**:
    - **Many-to-One** with lessons (Belongs To): Many quizzes belong to one lesson.

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9. Category

- **Relation**: "Classifies"
- **Cardinalities**:
    - **One-to-Many** with courses (Classifies): One category can classify many courses.

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10. Payments

- **Relation**: "Paid By" / "Paid For"
- **Cardinalities**:
    - **Many-to-One** with users (Paid By): Many payments are made by one user (student).
    - **Many-to-One** with courses (Paid For): Many payments are made for one course.

---

11. Submissions

- **Relation**: "Submitted By" / "Belongs To"
- **Cardinalities**:
    - **Many-to-One** with users (Submitted By): Many submissions are made by one user (student).
    - **Many-to-One** with assignments (Belongs To): Many submissions are made for one assignment.

---

12. Notifications

- **Relation**: "Sent To"
- **Cardinalities**:
    - **Many-to-One** with users (Sent To): Many notifications are sent to one user.

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13. Assessment

- **Relation**: "Belongs To"
- **Cardinalities**:
    - **Many-to-One** with lessons (Belongs To): Many assessments belong to one lesson.

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14. Discussion

- **Relation**: "Posted By" / "Belongs To"
- **Cardinalities**:
    - **Many-to-One** with users (Posted By): Many discussion posts are made by one user.
    - **Many-to-One** with courses (Belongs To): Many discussion posts belong to one course.

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15. Badge

- **Relation**: "Awarded To"
- **Cardinalities**:
    - **Many-to-One** with users (Awarded To): Many badges are awarded to one user.

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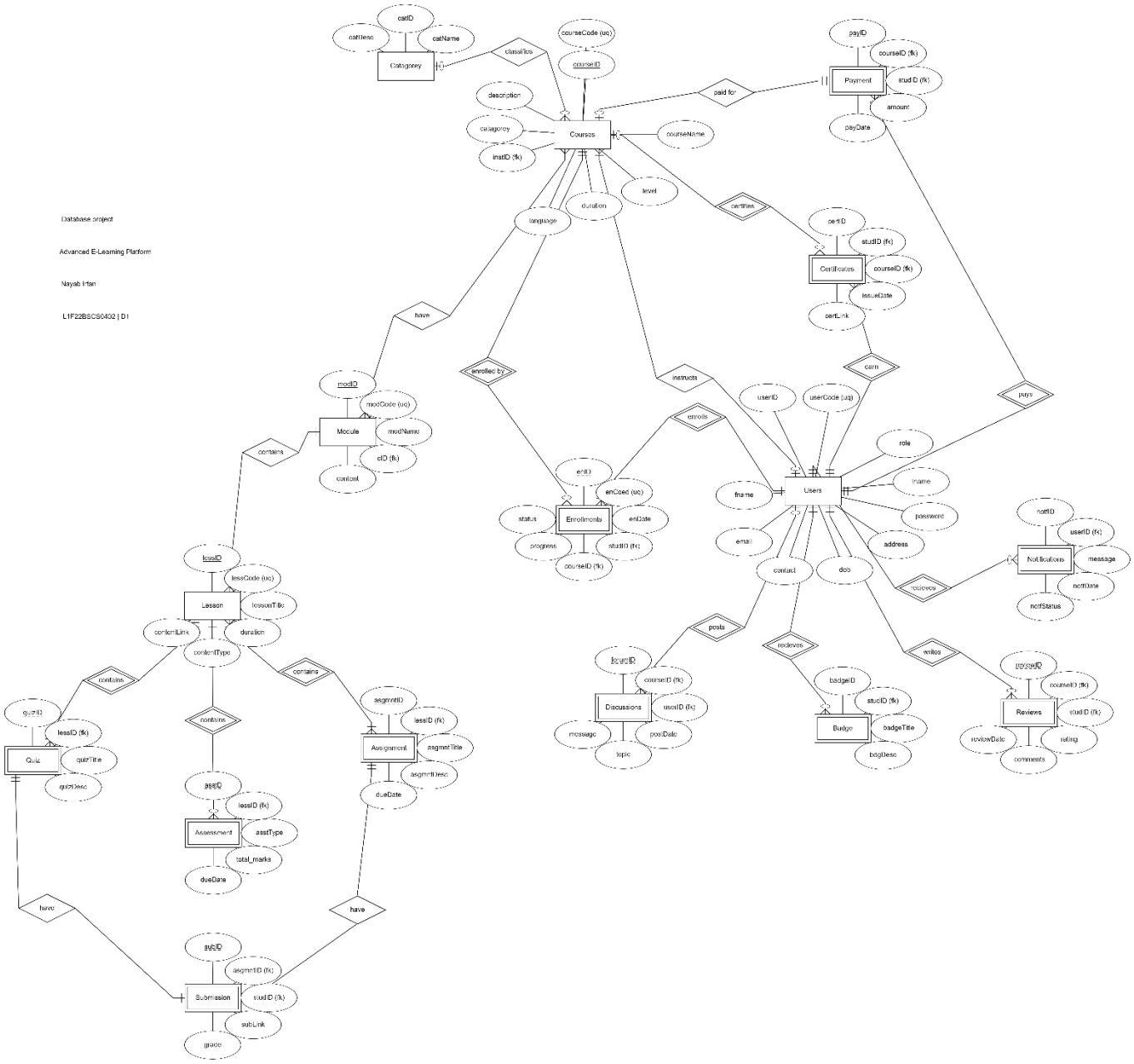
16. Certificate

- **Relation**: "Awarded To" / "Belongs To"
- **Cardinalities**:
    - **Many-to-One** with users (Awarded To): Many certificates are awarded to one user.
    - **Many-to-One** with courses (Belongs To): Many certificates are awarded for one course.

ERD:


Database project
Advanced E-Learning Platform
Nayab Irfan
L1F22BSCS0402 | D1
catID
catName
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Category
classifies
courseCode (uq)
courseID
description
category
instID (fk)
Courses
courseName
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language
paid for
payID
courseID (fk)
studID (fk)
Payment
amount
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certifies
certID
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Module
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userCode (uq)
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Lesson
lessonTitle
duration
contentLink
contentType
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contains
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quizID
lessID (fk)
Quiz
quizTitle
quizDesc
asstID
lessID (fk)
Assessment
asstType
total_marks
dueDate
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Assignment
asgmtTitle
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dueDate
have
have
subID
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Submission
studID (fk)
subLink
grade
posts
receives
writes
forumID
courseID (fk)
Discussions
userID (fk)
message
postDate
topic
badgeID
studID (fk)
Badge
badgeTitle
badgeDesc
revsID
courseID (fk)
Reviews
studID (fk)
rating
reviewDate
comments

JOIN Queries

1. Find Instructors and the Courses They Teach:

```
select u.fname, u.lname, c.courseName
from users u
inner join courses c on u.userID = c.instID
where u.role like 'Instructor';
```

fname	lname	courseName
Sara	Ali	Introduction to Computer Science
Hina	Farooq	Data Structures and Algorithms
Ahmad	Zafar	Mobile App Development
Hina	Farooq	Natural Language Processing
Sara	Ali	Operating Systems
Ahmad	Zafar	Game Development

2. Instructors' Ratings:

```
select distinct u.fname, u.lname, c.courseName, avg(r.rating) as avg_rating
from users u
join courses c on u.userID = c.instID
join reviews r on c.courseID = r.cID
where u.role like 'Instructor'
group by u.userID, c.courseID
order by avg_rating desc
LIMIT 3;
```

fname	lname	courseName	avg_rating
Hina	Farooq	Data Structures and Algorithms	4.800000
Sara	Ali	Introduction to Computer Science	4.500000
Ahmad	Zafar	Mobile App Development	4.400000

3. Displays students who haven't submitted asignments:

```
select u.fname, u.lname
from users u
left join submissions s on u.userID = s.sID
left join assignments a on s.asID = a.asgmntID
where s.subID is null AND u.role = 'Student';
```

	fname	lname
▶	Nida	Shaikh
	Farhan	Butt
	Bilal	Ahmed
	Zara	Hussain
	Hasan	Khalid
	Waseem	Khan
	Saad	Riaz
	Iman	Fatima
	Yasir	Ali

4. Instructor's salary per course:

```
select u.fname, u.lname, c.courseName, sum(p.amount) as salary
from users u
join courses c on u.userID = c.instID
join payments p on c.courseID = p.cID
group by u.userID
order by salary desc;
```

	fname	lname	courseName	salary
▶	Umar	Shah	Artificial Intelligence	900000.00
	Javed	Iqbal	Cybersecurity Fundamentals	750000.00
	Ahmad	Zafar	Mobile App Development	300000.00
	Iman	Fatima	Database Management Systems	250000.00
	Usman	Javed	Cloud Computing	225000.00
	Hina	Farooq	Data Structures and Algorithms	200000.00
	Zeeshan	Malik	Web Development	150000.00
	Nida	Shaikh	Big Data Analytics	100000.00
	Sara	Ali	Introduction to Computer Science	100000.00

5. Total revenue generated by each course:

```
select c.courseName, sum(p.amount) as totalRev
from courses c
join payments p on c.courseID = p.cID
group by c.courseName
order by totalRev desc;
```

courseName	totalRev
Cybersecurity Fundamentals	750000.00
Artificial Intelligence	500000.00
Machine Learning	400000.00
Mobile App Development	300000.00
Database Management Systems	250000.00
Cloud Computing	225000.00
Data Structures and Algorithms	200000.00
Web Development	150000.00
Big Data Analytics	100000.00
Introduction to Computer Science	100000.00

150000.00

6. Average student progress by course:

```
select c.courseName, avg(e.progress) as avgProg
from courses c
join enroll e on c.courseID = e.cID
group by c.courseName
having avgProg > 50;
```

courseName	avgProg
Cybersecurity Fundamentals	75.800000
Data Structures and Algorithms	60.250000
Introduction to Computer Science	85.500000
Machine Learning	95.000000
Mobile App Development	65.000000
Web Development	90.000000

7. Find All Certificates Issued for Completed Courses:

```
select u.fname, u.lname, c.courseName, certf.certLink
from users u
inner join certificate certf on u.userID = certf.sID
inner join courses c on certf.cID = c.courseID
inner join enroll e on u.userID = e.studID and e.status = 'Completed';
```

fname	lname	courseName	certLink
Ahmad	Zafar	Cloud Computing	https://www.coursera.org/account/accomplishments/certificate/KJV7XLLRLG4U
Nayab	Irfan	Introduction to Computer Science	https://www.coursera.org/account/accomplishments/certificate/TMQKP3QHGKB5
Zeeshan	Malik	Mobile App Development	https://www.coursera.org/account/accomplishments/certificate/3LWTFBWM2H63
Ali	Ahmed	Data Structures and Algorithms	https://www.coursera.org/account/accomplishments/certificate/LFBDYCFZQ3Y5

8. Find Quizzes and Their Associated Lessons and Courses

select q.qtext, l.ltitle as topic, c.courseName
from quiz q
inner join lessons l on q.asID = l.lessonID
inner join modules m on l.modID = m.moduleID
inner join courses c on m.cID = c.courseID;

qtext	topic	courseName
What is the time complexity of bubble sort?	Bubble Sort and Insertion Sort	Introduction to Computer Science
Write a Python function to implement a neural n...	Searching Algorithms	Introduction to Computer Science
What is the difference between supervised and...	Linked List Operations	Introduction to Computer Science
What is the purpose of data normalization in ma...	Binary Trees	Introduction to Computer Science
Write a Java function to implement a binary sea...	Dynamic Programming	Data Structures and Algorithms
What is the difference between a hash table an...	Linear Regression	Artificial Intelligence
What is the purpose of regularization in machin...	Convolutional Neural Networks	Artificial Intelligence
Write a Python function to implement a decision...	HTML Basics	Web Development
What is the difference between a convolutional ...	Introduction to SQL	Database Management Systems
What is the purpose of feature engineering in m...	Building Forms in Flutter	Mobile App Development

9. List all lessons with their course and module:

select l.ltitle as topic, m.moduleName, c.courseName
from lessons l
inner join modules m on l.modID = m.moduleID
inner join courses c on m.cID = c.courseID;

topic	moduleName	courseName
Bubble Sort and Insertion Sort	Introduction to Algorithms	Introduction to Computer Science
Searching Algorithms	Introduction to Algorithms	Introduction to Computer Science
Linked List Operations	Data Structures Basics	Introduction to Computer Science
Binary Trees	Data Structures Basics	Introduction to Computer Science
Dynamic Programming	Algorithm Design	Data Structures and Algorithms
Linear Regression	Machine Learning Basics	Artificial Intelligence
Convolutional Neural Networks	Neural Networks	Artificial Intelligence
HTML Basics	HTML & CSS	Web Development
Introduction to SQL	SQL Fundamentals	Database Management Systems
Building Forms in Flutter	Building Mobile UIs	Mobile App Development

10. Top 5 Courses with the Most Revenue:

```
select c.courseName, sum(p.amount) as totalRev
from courses c
inner join payments p on c.courseID = p.cID
group by c.courseName
order by totalRev desc
limit 5;
```

courseName	totalRev
Cybersecurity Fundamentals	750000.00
Artificial Intelligence	500000.00
Machine Learning	400000.00
Mobile App Development	300000.00
Database Management Systems	250000.00

Phase-02

Corelated Queries

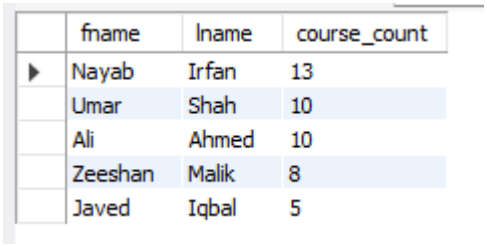
1. **Find the courses where the average score of students in their assessments is higher than the average score of all courses (along with student names).**

```
select c.courseName, u.fname, u.lname, avg(a.score) as course_avg
from courses c
join lessons l on c.courseID = l.courseID
join assessment a on l.lessonID = a.lessonID
join users u on a.sID = u.userID
group by c.courseID
having avg(a.score) > (select avg (score) from assessment);
```

courseName	fname	lname	course_avg
Data Structures and Algorithms	Hasan	Khalid	43.0000
Database Management Systems	Ayesha	Bashir	38.0000
Big Data Analytics	Fahim	Ahmed	36.0000
Operating Systems	Faisal	Shah	48.0000
Data Science Foundations	Farhan	Butt	37.0000
Database Systems	Sadia	Ali	43.0000
Machine Learning Operations	Aqsa	Khan	37.0000
Computer Vision	Adeel	Ahmed	38.0000
Cloud Data Architecture	Rayyan	Malik	39.0000
Digital Marketing	Haris	Khan	43.0000
Advanced Data Structures	Ayesha	Khan	48.0000
Database Management	Kashif	Raza	38.0000
Embedded Systems Programming	Umair	Shah	41.3333
Web Content Creation	Saad	Riaz	37.0000
IT Project Management	Asma	Tariq	41.0000
Game Development with Unity	Kashif	Raza	48.0000
Network Protocol Analysis	Zohaib	Hassan	45.0000
Game Development with Unreal...	Rabia	Hussain	50.0000
Database Security and Complia...	Zara	Hussain	49.0000
Software Engineering Manage...	Raza	Qureshi	37.0000
AI for Finance	Bilal	Ahmed	46.0000
Cybersecurity Awareness and ...	Adeel	Ahmed	36.0000
Machine Learning with R and P...	Raza	Qureshi	42.0000
AI for Cybersecurity	Hamza	Shah	46.0000
Game Development with Java	Jawad	Malik	45.5000
IT Management and Leadership	Umar	Shah	43.0000
Software Engineering for Cloud...	Farhan	Butt	45.0000
Network Security Essentials	Asma	Tariq	44.5000

2. Which student has enrolled in the most courses?

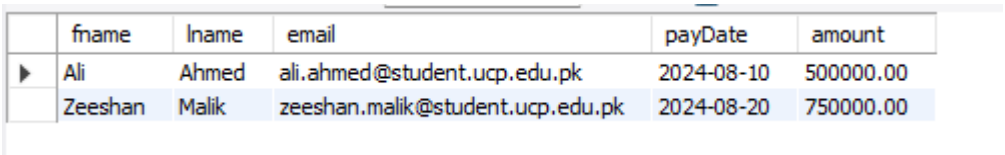
```
select u.fname, u.lname, count(e.cID) as course_count
from users u
join enroll e on u.userID = e.studID
where u.role = 'Student'
group by u.userID
order by count(e.cID) desc;
```



fname	lname	course_count
Nayab	Irfan	13
Umar	Shah	10
Ali	Ahmed	10
Zeeshan	Malik	8
Javed	Iqbal	5

3. Payment Reminder (send notification (emails) to students)

```
select u.fname, u.lname, u.email, p.payDate, p.amount
from Users u
join Payments p on u.userID = p.sID
where p.status = 'Pending' and u.role = 'Student' and datediff(curdate(),
p.payDate) > 7;
```



fname	lname	email	payDate	amount
Ali	Ahmed	ali.ahmed@student.ucp.edu.pk	2024-08-10	500000.00
Zeeshan	Malik	zeeshan.malik@student.ucp.edu.pk	2024-08-20	750000.00

4. Students active on Discussion Forums

```
select u.userID, u.fname, u.lname, count(df.postID) as postcount
from users u
join discussionForum df on u.userID = df.sID
where u.role = 'Student'
group by u.userID
order by postcount desc;
```

userID	fname	lname	postcount
33	Ayesha	Ali	1
74	Hassan	Raza	1
19	Saad	Riaz	1
63	Hamad	Khan	1
52	Sadia	Ali	1
93	Sobia	Hussain	1
7	Zeeshan	Malik	1
40	Rayyan	Malik	1
82	Ayesha	Raza	1
25	Asma	Tariq	1
69	Amir	Hussain	1
58	Ayesha	Bashir	1
100	Bilal	Qureshi	1
14	Bilal	Ahmad	1
48	Aqsa	Khan	1
88	Hafiz	Raza	1
34	Bilal	Hussain	1
75	Rashid	Malik	1
20	Iman	Fatima	1
65	Ahsan	Malik	1
54	Rabia	Hussain	1
95	Amna	Ali	1
10	Javed	Iqbal	1
41	Tahira	Bashir	1
83	Uzma	Hussain	1
27	Kashif	Raza	1
71	Umar	Farooq	1
59	Faisal	Shah	1

5. Display the students who have submitted all assignments for the courses they are enrolled in.

```
select u.fname, u.lname, c.courseName
from users u
join enroll e on u.userID = e.studID
join courses c on e.cID = c.courseID
join lessons l on c.courseID = l.courseID
left join assignments a on l.lessonID = a.lessID
left join submissions s on a.asgmntID = s.asID and s.sID = u.userID
group by u.userID, c.courseID
having count(distinct a.asgmntID) = count(distinct s.subID);
```

	fname	lname	courseName
▶	Nayab	Irfan	Natural Language Processing
	Nayab	Irfan	Internet of Things (IoT)
	Ali	Ahmed	Big Data Analytics
	Sara	Ali	Big Data Analytics
	Sara	Ali	Data Science Foundations
	Umar	Shah	Big Data Analytics
	Hina	Farooq	Big Data Analytics
	Ahmad	Zafar	Big Data Analytics

6. Identify courses that have more than 2 modules but less than 5 lessons across all modules.

```
select c.courseName
from courses c
where (
        select count(m.moduleID)
   from modules m
   where m.cID = c.courseID) > 2
and (
                select count(l.lessonID)
                from lessons l
                where l.modID in (
                                select modID
                                from modules
                                where courseID = c.courseID)) < 5;
```

	courseName
▶	Introduction to Computer Science
	Data Structures and Algorithms
	Artificial Intelligence
	Web Development
	Database Management Systems
	Mobile App Development

7. Instructors with High Student Satisfaction

```
select u.userID, u.fname, u.lname, AVG(r.rating) as avgRating
from users u
join courses c on c.instID = u.userID
join reviews r on c.courseID = r.cID
where r.rating > 4 and u.role = 'Instructor'
group by u.userID
having count(distinct c.courseID) > 2;
```

	userID	fname	lname	avgRating
▶	4	Sara	Ali	4.605882
	6	Hina	Farooq	4.627273

8. List the modules that have lessons with a total duration longer than the duration of all lessons in that course.

```
select m.moduleName
from modules m
where
(
        select SUM(l.duration)
        from lessons l
        where l.modID = m.moduleID) >
    (
                select AVG(l2.duration)
                from lessons l2
                where l2.modID IN (
                select modID
     from modules
     where courseID = m.cID
     )
);
```

	moduleName
▶	Introduction to Algorithms
	Data Structures Basics
	Algorithm Design
	SQL Fundamentals
	Introduction to Cryptography

9. Recommend courses to students based on their enrollment history.

```
select u.fname, u.lname, c.courseName as Course_Recommendation
from Users u
join Enroll e on u.userID = e.studID
join Courses c on e.cID = c.courseID
where c.category = (
  select category
  from Courses
  where courseID = e.cID
  and u.role = 'Student'
);
```

fname	lname	Course_Recommendation
Umar	Shah	Data Structures and Algorithms
Nayab	Irfan	Database Management Systems
Ali	Ahmed	Mobile App Development
Nayab	Irfan	Cybersecurity Fundamentals
Nayab	Irfan	Machine Learning
Javed	Iqbal	Introduction to Computer Science
Umar	Shah	Web Development
Nayab	Irfan	Cloud Computing
Ali	Ahmed	Machine Learning
Zeeshan	Malik	Introduction to Computer Science
Javed	Iqbal	Data Structures and Algorithms
Umar	Shah	Mobile App Development
Nayab	Irfan	Cybersecurity Fundamentals
Ali	Ahmed	Machine Learning
Zeeshan	Malik	Data Structures and Algorithms
Javed	Iqbal	Artificial Intelligence
Nayab	Irfan	Web Development
Umar	Shah	Cloud Computing
Ali	Ahmed	Big Data Analytics
Zeeshan	Malik	Artificial Intelligence
Javed	Iqbal	Web Development
Nayab	Irfan	Database Management Systems
Umar	Shah	Big Data Analytics
Ali	Ahmed	Machine Learning
Zeeshan	Malik	Web Development
Javed	Iqbal	Database Management Systems
Nayab	Irfan	Mobile App Development
Umar	Shah	Machine Learning
Ali	Ahmed	Introduction to Computer Science

10. Display the courses where the average review rating is higher than 4.5 across all students.

```
select c.courseName, AVG(r.rating) as avg_rating
from courses c
join reviews r on c.courseID = r.cID
group by c.courseID
having AVG(r.rating) > 4.5
order by avg_rating desc;
```

courseName	avg_rating
IT Project Management	4.900000
Game Development with Unity and C#	4.900000
Web Development	4.900000
Machine Learning	4.900000
Machine Learning	4.900000
Network Security	4.900000
Database Modeling	4.900000
Web Development with Angular	4.900000
Embedded Systems Programming	4.900000
Software Engineering Methodologies	4.900000
Machine Learning with Python	4.900000
AI for Healthcare	4.900000
Artificial Intelligence Ethics and Law	4.900000
Big Data Analytics	4.800000
Cloud Security	4.800000
Software Engineering	4.800000
Machine Learning with TensorFlow	4.800000
Network Threat Analysis	4.800000
Cybersecurity Threats	4.800000
Data Visualization and Analytics	4.800000
Software Development Life Cycle	4.800000
Data Structures and Algorithms	4.800000
IT Project Planning and Management	4.800000
Cybersecurity Awareness and Training	4.800000
Object-Oriented Programming	4.800000
Digital Marketing Analytics	4.700000
Network Protocol Analysis	4.700000
Network Protocol Analysis and Design	4.700000

11. Students with Completed Courses and Badges

```
select u.userID, u.fname, u.lname, count(cert.certID) as completioncount,
b.badgeName
from users u
join certificate cert on u.userID = cert.sID
join badges b on cert.cID = b.bdgID
where u.role = 'Student' and cert.issueDate IS NOT NULL
group by u.userID;
```

userID	fname	lname	completioncount	badgeName
2	Nayab	Irfan	1	Student
3	Ali	Ahmed	1	Learner
5	Umar	Shah	1	Explorer
7	Zeeshan	Malik	1	Leader
10	Javed	Iqbal	1	Master
11	Usman	Javed	1	Scholar
12	Nida	Shaikh	1	Researcher
13	Farhan	Butt	1	Innovator
14	Bilal	Ahmad	1	Collaborator
15	Zara	Hussain	1	Visionary
16	Hasan	Khalid	1	Pioneer
18	Waseem	Khan	1	Champion
19	Saad	Riaz	1	Thought Le...
20	Iman	Fatima	1	Community ...
21	Yasir	Ali	1	Expertise
22	Ayesha	Khan	1	Trailblazer
23	Raza	Qureshi	1	Socialite
25	asma	Tariq	1	Luminary
27	Kashif	Raza	1	Pacesetter
29	Zohaib	Hassan	1	Vanguard
31	Iqra	Nawaz	1	Icon
33	Ayesha	Ali	1	Excellence
34	Bilal	Hussain	1	Vintage
36	Umair	Shah	1	Hero
37	Hafsa	Khan	1	Legend
38	Aliya	Ahmed	1	Champion o...
40	Rayyan	Malik	1	Legacy
41	Tahira	Bashir	1	Visionary L...

12. Students with High assignment Scores

```
select u.userID, u.fname, u.lname, AVG(a.score) as avgScore
from users u
join submissions s on u.userID = s.sID
join assessment a on s.asID = a.asID
where u.role = 'Student' -- and a.score > 80
group by u.userID
order by avgScore desc;
```

userID	fname	lname	avgScore
51	Haris	Khan	50.0000
14	Bilal	Ahmad	50.0000
23	Raza	Qureshi	49.0000
29	Zohaib	Hassan	49.0000
27	Kashif	Raza	46.0000
19	Saad	Riaz	46.0000
7	Zeeshan	Malik	43.0000
41	Tahira	Bashir	41.0000
38	Aliya	Ahmed	41.0000
45	Rimsha	Hussain	41.0000
33	Ayesha	Ali	39.0000
15	Zara	Hussain	38.0000
58	Ayesha	Bashir	36.0000
12	Nida	Shaikh	36.0000
49	Hamza	Shah	36.0000
5	Umar	Shah	35.0000
54	Rabia	Hussain	35.0000
3	Ali	Ahmed	34.6000
10	Javed	Iqbal	34.0000
59	Faisal	Shah	33.0000
48	Aqsa	Khan	33.0000
44	Furqan	Ali	33.0000
40	Rayyan	Malik	31.0000
31	Iqra	Nawaz	30.0000
50	Amna	Ahmed	29.0000
56	Hina	Khan	29.0000
37	Hafsa	Khan	28.0000
36	Umair	Shah	26.0000

Sub – Queries

1. **Displays every course name with the total count of its modules in descending order**

```
select c.courseName,
(select count(*)
from modules m
where m.cID = c.courseID) AS module_count
from courses c
order by module_count desc;
```

courseName	module_count
Introduction to Computer Science	4
Web Development	4
Data Structures and Algorithms	3
Artificial Intelligence	3
Database Management Systems	3
Mobile App Development	3
Cybersecurity Fundamentals	2
Cloud Computing	2
Big Data Analytics	2
Machine Learning	1
Natural Language Processing	1
Digital Marketing	1
Blockchain Development	1
Software Engineering Practices	1
Operating Systems	1
Data Science Foundations	1
Game Development	1
Advanced Networking	1
Internet of Things (IoT)	1
Human-Computer Interaction	1
Web Development Basics	1
Database Systems	1
Machine Learning Operations	1
Software Engineering Principles	1
DevOps Basics	1
Computer Vision	1

2. **Displays the names of all students who enrolled in courses in the year 2024 (using exists).**

```
select u.fname, u.lname
from users u
where exists (
   select 1
   from enroll e
   where e.studID = u.userID
   and year(e.enDate) = 2024
)
and u.role = 'Student';
```

fname	lname
Nayab	Irfan
Ali	Ahmed
Umar	Shah
Zeeshan	Malik
Javed	Iqbal

3. **Display the names of those instructors whose at least one student lives in 'Cantt' (using ANY operator).**

```
select u.fname, u.lname
from users u
where u.role = 'instructor'
and u.userID = ANY (
   select c.instID
   from courses c
   inner join enroll e ON c.courseID = e.cID
   inner join users s ON e.studID = s.userID
   where s.address LIKE '%Cantt%'
);
```

fname	lname
Sara	Ali

4. **Display module IDs whose content length is less than the average content length of all modules.**

```
select m.moduleID, m.moduleName
from modules m
where length(m.content) < (
   select avg(length(content)) from modules);
```

moduleID	moduleName
21	Introduction to OOP
22	Data Structures in Practice
23	Machine Learning Fundamentals
24	Network Fundamentals
25	Security Threats
26	Database Design
27	Deep Learning Applications
28	Software Testing
29	Network Architecture
30	Database Security
31	Computer Vision Fundamentals
34	Network Protocol Analysis
35	Database Administration
37	Web Development Frameworks
38	IT Project Management
43	Database Modeling
45	Web Scraping and Crawling
46	IT Service Management
47	Machine Learning with PyTorch
48	Computer Vision Applications
49	Compliance and Risk Management
51	Distributed Computing Systems
53	Geographic Information Systems
54	High-Performance Computing
56	Mobile Device Security
57	Natural Language Processing
64	Web Development Security
65	Cross-Site Scripting Prevention

5. **Retrieve the total duration of each Computer Science categorey, sorted in ascending order.**

```
select c.courseName, sum(c.duration) as Duration
from Courses c
where c.category = 'Computer Science'
group by courseID
order by duration asc;
```

courseName	Duration
Network Security Essentials	30
Python Programming	30
Object-Oriented Programming	30
Network Fundamentals	30
Introduction to Computer Science	30
Computer Networks	30
Cyber Security	30
Embedded Systems Programming	40
Software Engineering	45
Network Planning and Configuration	45
Internet of Things (IoT)	45
Network Configuration and Security	45
Database Administration	45
IT Project Management	45
Advanced Data Structures	45
Data Structures and Algorithms	45
Database Management	45
Network Threat Analysis	45
Operating Systems	45
Database Systems	50
Cloud Computing	55
Network Security	60
Machine Learning	60
Network Architecture	60
Network Protocol Analysis	60
Blockchain Architecture	60
Artificial Intelligence	60

6. **Display the instructors' names and course names for instructors who are teaching courses with less than 5 lessons**

```
select u.fname, u.lname, c.courseName
from users u
inner join courses c ON u.userID = c.instID
where (select count(*)
    from lessons l
    inner join modules m ON l.modID = m.moduleID
    where m.cID = c.courseID) < 5 and u.role = 'instructor';
```

fname	lname	courseName
Hina	Farooq	Web Development
Sara	Ali	Machine Learning
Hina	Farooq	Blockchain Development
Ahmad	Zafar	Advanced Networking
Sara	Ali	Machine Learning Operations
Sara	Ali	Computer Vision
Sara	Ali	Machine Learning
Hina	Farooq	Database Management
Sara	Ali	Deep Learning
Hina	Farooq	Database Administration
Hina	Farooq	Database Security
Sara	Ali	Machine Learning with TensorFlow
Sara	Ali	Artificial Intelligence Ethics
Hina	Farooq	Game Design Principles
Sara	Ali	Machine Learning with PyTorch
Sara	Ali	AI for Healthcare
Hina	Farooq	Game Development with Unity
Sara	Ali	Machine Learning with R
Sara	Ali	Data Visualization and Analytics
Hina	Farooq	Information Security and Compliance
Sara	Ali	Computer Vision and Deep Learning
Sara	Ali	Artificial Intelligence Ethics and Law
Hina	Farooq	Game Development with Unreal Engine
Hina	Farooq	Database Security and Compliance
Sara	Ali	Machine Learning with Python
Sara	Ali	AI for Finance
Hina	Farooq	Game Development with Unity and C#
Sara	Ali	Machine Learning with R and Python

7. Display the names of courses that have lessons of type 'Quiz'.

```
select c.courseName
from courses c
where exists (
   select 1
   from lessons l
   inner join modules m ON l.modID = m.moduleID
   where m.cID = c.courseID
   and l.contentType = 'Quiz'
);
```

courseName
Mobile App Development

8. **Display the names of students who have not enrolled in any courses in 2024.**

```
select u.fname, u.lname
from users u
where u.role = 'Student'
and not exists (
   select 1
   from enroll e
   where e.studID = u.userID
   and year(e.enDate) = 2024
);
```

fname	lname
Usman	Javed
Nida	Shaikh
Farhan	Butt
Bilal	Ahmad
Zara	Hussain
Hasan	Khalid
Waseem	Khan
Saad	Riaz
Iman	Fatima
Yasir	Ali
Ayesha	Khan
Raza	Qureshi
asma	Tariq
Kashif	Raza
Zohaib	Hassan
Iqra	Nawaz
Ayesha	Ali
Bilal	Hussain
Umair	Shah
Hafsa	Khan
Aliya	Ahmed
Rayyan	Malik
Tahira	Bashir
Laiba	Ahmed
Furqan	Ali
Rimsha	Hussain
Sana	Malik
Aqsa	Khan

9. **Display the names of students who have enrolled in courses with at least one level of "Advanced" course.**

```
select u.fname, u.lname
from users u
where u.role = 'Student'
and exists (
   select 1
   from courses c
   where c.level = 'Advanced'
   and exists (
      select 1
      from enroll e
      where e.clD = c.courseID
      and e.studID = u.userID
   )
);
```

	fname	lname
▶	Nayab	Irfan
	Ali	Ahmed
	Umar	Shah
	Zeeshan	Malik
	Javed	Iqbal

10. **Display the names of instructors who are teaching less than 3 courses.**

```
select u.fname, u.lname
from users u
where u.role = 'instructor'
and (select count(*) from courses c where c.instID = u.userID) < 3;
```

	fname	lname
▶	Ahmad	Zafar
	Faizan	Mirza
	Bilal	Ahmed
	Fahad	Butt
	Shahid	Iqbal
	Faisal	Ahmed
	Sadia	Malik
	Maha	Farooq
	Shahzad	Khan
	Mudassar	Hussain
	Jawad	Ahmed
	Saima	Ahmed
	Nadia	Hussain
	Sadia	Bashir
	Shazia	Hussain
	Rumaisa	Khan
	Kashif	Ahmed
	Shahida	Hussain
	Faisal	Raza
	Fatima	Shaikh

11. Display the names of all courses that have more than 2 modules.

select c.courseName
from courses c
where (select count(*) from modules m where m.cID = c.courseID) > 2;

	courseName
▶	Introduction to Computer Science
	Data Structures and Algorithms
	Artificial Intelligence
	Web Development
	Database Management Systems
	Mobile App Development

Nested – Queries

1. Average assessment score for 'advanced' level courses

```
select avg(score)
from assessment
where lessonID in (
   select lessonID
   from lessons
   where modID in (
      select modID
      from modules
      where cID in (
         select courseID
         from courses
         where level = 'Advanced'
      )
   )
);
```

	avg(score)
▶	32.9155

2. Find the total number of lessons in modules that belong to 'Data Structures and Algorithms' course

```
select count(lessonID)
from lessons
where modID in (
   select modID
   from modules
   where cID = (select courseID from courses where courseName = 'Data Structures and Algorithms')
);
```

	count(lessonID)
▶	71

3. **Students who have earned badges**

```
select fname, lname
from users
where userID in (
   select userID
   from badges
   where role = 'Student'
);
```

fname	lname
Nayab	Irfan
Ali	Ahmed
Umar	Shah
Zeeshan	Malik
Javed	Iqbal
Usman	Javed
Nida	Shaikh
Farhan	Butt
Bilal	Ahmad
Zara	Hussain
Hasan	Khalid
Waseem	Khan
Saad	Riaz
Iman	Fatima
Yasir	Ali
Ayesha	Khan
Raza	Qureshi
asma	Tariq
Kashif	Raza
Zohaib	Hassan
Iqra	Nawaz
Ayesha	Ali
Bilal	Hussain
Umair	Shah
Hafsa	Khan
Aliya	Ahmed

4. **List courses where students have made more than 10 submissions in total but the average quiz score is below 60:**

```
select courseName
from courses
where courseID in (
   select courseID
   from submissions
```

```
    group by courseID
    having count(subID) > 10
)
and courseID in (
    select courseID
    from assessment
    where type = 'Quiz'
    group by courseID
    having avg(score) < 60
);
```

courseName
Introduction to Computer Science
Data Structures and Algorithms
Artificial Intelligence
Web Development
Database Management Systems
Mobile App Development
Cybersecurity Fundamentals
Cloud Computing
Big Data Analytics
Machine Learning
Natural Language Processing
Digital Marketing
Blockchain Development
Software Engineering Practices
Operating Systems
Data Science Foundations
Game Development
Advanced Networking
Internet of Things (IoT)
Human-Computer Interaction
Web Development Basics
Database Systems
Machine Learning Operations
Software Engineering Principles
DevOps Basics
Computer Vision
Cybersecurity Fundamentals
Python Programming

5. **Find lessons that belong to the course with the highest review ratings**

```
select courseID, ltitle as Title
from lessons
where modID in (
   select modID
   from modules
   where cID = (
      select courseID
      from reviews
      group by courseID
      order by avg(rating) desc
      limit 1
   )
);
```

courseID	Title
14	Bubble Sort and Insertion Sort
39	Searching Algorithms
29	Linked List Operations
29	Binary Trees
19	Dynamic Programming
45	Linear Regression
45	HTML Basics
99	Introduction to SQL
80	Building Forms in Flutter
6	Algorithm Basics
11	Data Structures in Action
72	Greedy Algorithms
3	HTML Tags & Structure
8	Computer Vision Applications
4	Neural Network Basics
86	Javascript Event Handling
2	Cybersecurity Best Practices
84	OOP Basics
92	Data Structures Tutorial
92	Machine Learning Demo
67	Network Fundamentals
17	Security Threats
76	Database Design
87	Deep Learning Applications
63	Software Testing
33	Network Architecture
82	Merge Sort and Quick Sort
42	Stacks and Queues

6. **Display the students' names and contact details who are enrolled in courses with a duration greater than 60 hours using an inner join.**

```
select u.fname, u.lname, u.contact
from users u
inner join courses c ON u.userID = c.instID
where c.duration > 20 and u.role = 'Student';
```

fname	lname	contact
Ali	Ahmed	03011234567
Umar	Shah	03031234567
Zeeshan	Malik	03051234567
Javed	Iqbal	03081234567
Usman	Javed	03091234567
Umar	Shah	03031234567
Nida	Shaikh	03101234567
Zeeshan	Malik	03051234567
Ali	Ahmed	03011234567
Usman	Javed	03091234567
Javed	Iqbal	03081234567
Nida	Shaikh	03101234567
Umar	Shah	03031234567
Ali	Ahmed	03011234567
Ali	Ahmed	03011234567
Umar	Shah	03031234567
Umar	Shah	03031234567
Ali	Ahmed	03011234567
Umar	Shah	03031234567
Ali	Ahmed	03011234567
Ali	Ahmed	03011234567
Umar	Shah	03031234567
Nayab	Irfan	03001234567
Ali	Ahmed	03011234567
Nayab	Irfan	03001234567
Ali	Ahmed	03011234567
Zeeshan	Malik	03051234567
Ali	Ahmed	03011234567

7. **Display the first and last name of the instructor along with the course name for the course with the maximum duration.**

```
select u.fname, u.lname, c.courseName
from users u
inner join courses c ON u.userID = c.instID
where c.duration = (select max(duration) from courses)
and u.role = 'instructor';
```

fname	lname	courseName
Sara	Ali	Artificial Intelligence
Hina	Farooq	Blockchain Development
Ahmad	Zafar	Advanced Networking
Sara	Ali	Machine Learning Operations
Sara	Ali	Machine Learning
Sara	Ali	Deep Learning
Hina	Farooq	Information Security and Compliance
Sara	Ali	Computer Vision and Deep Learning
Hina	Farooq	Database Security and Compliance
Sara	Ali	Machine Learning with Neural Networks
Sara	Ali	Machine Learning for Cybersecurity

8. Retrieve users who are instructors of not Advanced courses.

```
select u.*
from users u
where u.userID in (select instID from courses)
and u.userID not in (select instID from courses where level = 'Advanced');
```

userID	userCode	fname	lname	email	password	role	contact	dob	address
8	L1F24FOIT0402	Iman	Fatima	iman.fatima0402@admin.ucp.edu.pk	password1235	Admin	03061234567	1990-10-28	Iqbal Town, Lahore
12	L1F24BSSE8716	Nida	Shaikh	nida.shaikh@student.ucp.edu.pk	password9898	Student	03101234567	2002-08-21	DHA Phase 5, Lahore

9. Display the names of students who have enrolled in courses with at least one level of "Advanced" course.

```
select u.fname, u.lname, l.*, c.courseName
from lessons l
inner join modules m ON l.modID = m.moduleID
inner join courses c ON m.cID = c.courseID
inner join users u ON c.instID = u.userID;
```

fname	lname	lessonID	lessnCode	modID	ltitle	contentType	contentLink	duration	courseID	courseName
Ali	Ahmed	1	L001	1	Bubble Sort and Insertion Sort	Video	https://example.com/Bubble Sort and Insertion ...	20	14	Introduction to Computer Science
Ali	Ahmed	2	L002	1	Searching Algorithms	Video	https://example.com/Searching Algorithms	25	39	Introduction to Computer Science
Ali	Ahmed	3	L003	2	Linked List Operations	Text	https://example.com/Linked List Operations	15	29	Introduction to Computer Science
Ali	Ahmed	4	L004	2	Binary Trees	Text	https://example.com/Binary Trees	30	29	Introduction to Computer Science
Umar	Shah	5	L005	3	Dynamic Programming	Video	https://example.com/Dynamic Programming	40	19	Data Structures and Algorithms
Sara	Ali	6	L006	4	Linear Regression	Video	https://example.com/Linear Regression	35	45	Artificial Intelligence
Sara	Ali	7	L007	5	Convolutional Neural Networks	Video	https://example.com/Convolutional Neural Net...	50	108	Artificial Intelligence
Hina	Farooq	8	L008	6	HTML Basics	assignment	https://example.com/HTML Basics	10	45	Web Development
Zeeshan	Malik	9	L009	7	Introduction to SQL	Text	https://example.com/Introduction to SQL	20	99	Database Management Systems
Iman	Fatima	10	L0010	8	Building Forms in Flutter	Quiz	https://example.com/Building Forms in Flutter	25	80	Mobile App Development
Ali	Ahmed	11	LSN101	1	Algorithm Basics	Video	https://example.com/Algorithm Basics	20	6	Introduction to Computer Science
Ali	Ahmed	12	LSN102	2	Data Structures in Action	Video	https://example.com/Data Structures in Action	25	11	Introduction to Computer Science
Umar	Shah	13	LSN103	3	Greedy Algorithms	Text	https://example.com/Greedy Algorithms	15	72	Data Structures and Algorithms
Sara	Ali	14	LSN104	4	HTML Tags & Structure	Text	https://example.com/HTML Tags & Structure	10	3	Artificial Intelligence
Sara	Ali	15	LSN105	5	Deploying ML Models	Video	https://example.com/Deploying ML Models	30	107	Artificial Intelligence
Hina	Farooq	16	LSN106	6	Computer Vision Applications	Text	https://example.com/Computer Vision Applications	20	8	Web Development
Zeeshan	Malik	17	LSN107	7	SDLC Phases		https://example.com/SDLC Phases	15	105	Database Management Systems
Iman	Fatima	18	LSN108	8	Neural Network Basics	Video	https://example.com/Neural Network Basics	25	4	Mobile App Development
Ahmad	Zafar	19	LSN109	9	Javascript Event Handling	Video	https://example.com/Javascript Event Handling	18	86	Cybersecurity Fundamentals
Javed	Iqbal	20	LSN110	10	Cybersecurity Best Practices		https://example.com/Cybersecurity Best Practices	20	2	Cloud Computing
Ali	Ahmed	21	ITL101	1	OOP Basics	Video	https://example.com/OOP Basics	30	84	Introduction to Computer Science
Ali	Ahmed	22	DSL202	2	Data Structures Tutorial	Text	https://example.com/Data Structures Tutorial	45	92	Introduction to Computer Science
Umar	Shah	23	AIL303	3	Machine Learning Demo		https://example.com/Machine Learning Demo	60	92	Data Structures and Algorithms
Sara	Ali	24	NET401	4	Network Fundamentals	Video	https://example.com/Network Fundamentals	30	67	Artificial Intelligence
Sara	Ali	25	SEC501	5	Security Threats	Text	https://example.com/Security Threats	45	17	Artificial Intelligence
Hina	Farooq	26	DBM601	6	Database Design		https://example.com/Database Design	60	76	Web Development
Zeeshan	Malik	27	AIN702	7	Deep Learning Applications	Video	https://example.com/Deep Learning Applications	30	87	Database Management Systems
Iman	Fatima	28	ITM803	8	Software Testing	Text	https://example.com/Software Testing	45	63	Mobile App Development

10. Using the in command, display the users' names and the courses they are teaching, including only beginner-level courses.

```
select u.fname, u.lname, c.courseName
from users u
inner join courses c ON u.userID = c.instID
where c.level in ('Beginner');
```

fname	lname	courseName
Ali	Ahmed	Introduction to Computer Science
Hina	Farooq	Web Development
Ahmad	Zafar	Cybersecurity Fundamentals
Nida	Shaikh	Digital Marketing
Usman	Javed	Data Science Foundations
Nida	Shaikh	Human-Computer Interaction
Umar	Shah	Web Development Basics
Umar	Shah	DevOps Basics
Umar	Shah	Cybersecurity Fundamentals
Ali	Ahmed	Python Programming
Nayab	Irfan	Computer Networks
Rabia	Bashir	Cyber Security
Nayab	Irfan	Web Content Creation
Umar	Shah	Computer Vision Fundamentals
Rabia	Bashir	Network Fundamentals
Umar	Shah	Cybersecurity Threats
Umar	Shah	Cybersecurity Fundamentals
Umar	Shah	Cybersecurity Awareness and Training
Nayab	Irfan	IT Ethics and Professionalism
Rabia	Bashir	Network Security Essentials

11. Display the names and roles of all users, along with the course name they are teaching or learning, using multiple RIGHT JOIN

```
select u.fname, u.lname, u.role, c.courseName
from users u
RIGHT JOin courses c ON u.userID = c.instID
RIGHT JOin modules m ON c.courseID = m.cID;
```

fname	lname	role	courseName
Ali	Ahmed	Student	Introduction to Computer Science
Ali	Ahmed	Student	Introduction to Computer Science
Ali	Ahmed	Student	Introduction to Computer Science
Ali	Ahmed	Student	Introduction to Computer Science
Umar	Shah	Student	Data Structures and Algorithms
Umar	Shah	Student	Data Structures and Algorithms
Umar	Shah	Student	Data Structures and Algorithms
Sara	Ali	Instructor	Artificial Intelligence
Sara	Ali	Instructor	Artificial Intelligence
Sara	Ali	Instructor	Artificial Intelligence
Hina	Farooq	Instructor	Web Development
Hina	Farooq	Instructor	Web Development
Hina	Farooq	Instructor	Web Development
Hina	Farooq	Instructor	Web Development
Zees...	Malik	Student	Database Management Systems
Zees...	Malik	Student	Database Management Systems
Zees...	Malik	Student	Database Management Systems
Iman	Fatima	Admin	Mobile App Development
Iman	Fatima	Admin	Mobile App Development
Iman	Fatima	Admin	Mobile App Development
Ahmad	Zafar	Instructor	Cybersecurity Fundamentals
Ahmad	Zafar	Instructor	Cybersecurity Fundamentals
Javed	Iqbal	Student	Cloud Computing
Javed	Iqbal	Student	Cloud Computing
Usman	Javed	Student	Big Data Analytics
Usman	Javed	Student	Big Data Analytics
Sara	Ali	Instructor	Machine Learning
Umar	Shah	Student	Natural Language Processing

12. Display the course names of all courses that have both lessons and modules assigned to them, using multiple in commands.

```
select c.courseName
from courses c
where c.courseID in (select m.cID from modules m)
and c.courseID in (select l.modID from lessons l);
```

courseName
Introduction to Computer Science
Data Structures and Algorithms
Artificial Intelligence
Web Development
Database Management Systems
Mobile App Development
Cybersecurity Fundamentals
Cloud Computing
Big Data Analytics
Machine Learning