Online Education Platform database design

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Introduction: -

The pace at which technology is evolving has led to a surge in people's thirst for knowledge in a wide range of cutting-edge tools and techniques. With the internet offering an endless stream of educational resources, an increasing number of individuals are turning to online learning platforms to acquire new skills and stay up to date with the latest developments in their fields. The increasing demand for online education has led to the emergence of online course providing systems such as Coursera, edX, and Udemy. The goal of our database design is to create an efficient and user-friendly platform that bridges users with courses offered by universities. To achieve this goal, a comprehensive database system will be developed that help users find relevant courses based on their interests, connect with universities and instructors, track their progress, and earn certificates upon completion.

Context: -

The online education industry has gained significant momentum in recent years, with a growing number of students seeking flexible, affordable, and accessible education options. The online course providing system is a response to this growing demand, offering users the opportunity to enroll in courses offered by reputable universities worldwide. The platform is designed to support a diverse range of academic disciplines, providing a comprehensive education experience for users regardless of their location or academic background.

Users: -

The online course providing system caters to a diverse range of users, including students, employees, and instructors. The primary users of the platform are students who use the website to enroll in courses, complete assignments, and receive certifications upon completion. These courses can be within their area of interests or based on current trends. The employees are secondary users who are looking to upscale themselves with the market needs and are looking to grow professionally enroll to the courses which are in high demand. Instructors also play a key role assessing the work done by the other users. Instructors are responsible for designing and delivering high-quality courses and providing feedback to students.

Information Needs: -

The database system will store and manage essential information related to the online education platform's operation. The information needs of the platform include:

1. User Information - The database will store comprehensive user data, including personal information, login credentials, and payment details. This data will enable users to access the platform, enroll in courses, check their assignments and complete them. They can also set career goals and can complete all the courses that can make them move closer towards their aspirations. The database will also manage user data privacy settings whether to share the data or not.
2. Course Information - The database will store detailed course information, including course name, description, prerequisites, duration, instructor details, and course content. This data will enable students to search, filter, and enroll in courses that meet their academic needs.
3. University Information - The database will store the universities information along with their name, world rankings, university location so that users will know which course is being offered by which university and can also access the credibility of the certificate by looking over their global rankings.
4. Instructor information – The database will store instructors' information with details like name of the instructor, email id, university he's related to, instructors' research work, relevant experience so that the users can search for instructors whose research topic is within their area of interest and take courses from them, mail them in case of any queries.
5. Assignment Information - The database will store assignment-related information, including assignment name, description, weightage, and due dates. This data will enable students to keep track of their assignments, submit them on time, and receive feedback from instructors.
6. Enroll Information - The database will store enrollment history which will be useful for the platform to track what courses are mostly taken by the users, and user status whether the user dropped, completed or in progress with the course
7. Payment Information - The database will store information related to payments, including payment ID and payment date. This data will enable the platform to manage its finances and provide users with accurate payment-related information.
8. Certification Information - The database will store certification-related information, including certification name, date of issuance, and certification ID. This data will enable students to showcase their academic achievements and help the platform maintain its credibility.

So, by considering all these information needs we have created 15 tables which covers all the core aspects of our database design. There is always a possibility of having other entities, but it varies from platform to platform and their business needs. Our entities are going to suffice our database need of being a hassle-free education providing platform.

DATA DICTIONARY: -

Table Name	Attribute Name	Contents	Data Type	Format	Range	Required	PK/FK	Reference
USERS	USER_ID	User ID	INT (6)	999999	1-999999	Y	PK	
	USER_NAME	User's username	VARCHAR (25)	Xxxxxxxx				
	USER_FNAME	User first name	VARCHAR (25)	Xxxxxxxx		Y		
	USER_LNAME	User last name	VARCHAR (25)	Xxxxxxxx		Y		
	EMAIL_ID	User's email id	VARCHAR (25)	Xxxxxxxx		Y		
	PASSWORD	User's password	VARCHAR (25)	Xxxxxxxx		Y		
	USER_DOB	User's date of birth	DATE	MM/DD/YYYY		N		
	PHN_NO	User's phone number	CHAR (12)	999-999-9999		Y		
	USER_LOCATION	User's Location	VARCHAR (50)	Xxxxxxxx		N		
	IS_EMPLOYEE	Is user employed or not: - YES or NO	CHAR (3)	Xxx	YES/NO	Y		
	IS_STUDENT	Is user student or not: - YES or NO	CHAR (3)	Xxx	YES/NO	Y		

	IS_INSTRUCTOR	Is user instructor or not: - YES or NO	CHAR (3)	Xxx	YES/NO	Y		
	USER_DESCRIPTION	User's brief description	VARCHAR (200)	Xxxxxxxx		N		
	CAREER_GOAL	User's Career goal	VARCHAR (25)	Xxxxxxxx		N		
EMPLOYEE	USER_ID	User ID	INT (6)	999999	1-999999	Y	PK/FK	USERS
	JOB_TITLE	User's job title	VARCHAR (20)	Xxxxxxxx		Y		
	JOB_INDUSTRY	User's job industry it belongs to	VARCHAR (25)	Xxxxxxxx		Y		
	EMPLOYER	User's employer	VARCHAR (20)	Xxxxxxxx		N		
	TOTAL_EXP	User's total work experience	FLOAT (2,2)	99	1-99	N		
STUDENT	USER_ID	User ID	INT (6)	999999	1-999999	Y	PK/FK	USERS
	UNIVERSITY_ID	User's university id	VARCHAR (25)	Xxxxxxxx		Y	FK	UNIVERSITY
	STUDENT_MAJOR	student's MAJOR	VARCHAR (25)	Xxxxxxxx		Y		
	STUDENT_GRAD_STDATE	Students' graduation start date	DATE	MM/DD/YYYY		N		
	STUDENT_GRADEND	Students' graduation end date	DATE	MM/DD/YYYY		Y		

	STUDENT_GPA	Students' current GPA	FLOAT (1,1)	1	1-4	N		
INSTRUCTOR	USER_ID	User ID	INT (6)	999999	1-999999	Y	PK/FK	USERS
	INST_NAME	Instructor name	VARCHAR (25)	Xxxxxxx		Y		
	UNIVERSITY_ID	Instructors' university ID	INT (5)	99999	1-99999	Y	FK	UNIVERSITY
	INST_MAILID	Instructors mail id	VARCHAR (30)	Xxxxxxx		Y		
	INST_EXP	Instructor experience	VARCHAR (10)	Xxxxxxx		N		
	INST_RT	Instructor research topic	VARCHAR (500)	Xxxxxxx		N		
UNIVERSITY	UNIVERSITY_ID	University's ID	CHAR (5)	Xxxxx		Y	PK	
	UNIVERSITY_NAME	University name	VARCHAR (25)	Xxxxxxxx		Y		
	UNIVERSITY_QSRANKING	University world ranking	INT (7)	9999999	1-9999999	Y		
	UNIVERSITY_LOGO	University logo	BLOB			Y		
	UNIVERSITY_COUNTRY	University's country it belongs to	VARCHAR (25)	Xxxxxxxx		Y		
	UNIVERSITY_STATE	University's state it belongs to	VARCHAR (25)	Xxxxxxxx		Y		

	UNIVERSITY_CITY	University's city it belongs to	VARCHAR (25)	Xxxxxxxx		Y		
	UNIVERSITY_TYPE	Type of the university (Public/Private)	CHAR (8)	Xxxxxxxx		Y		
COURSES	COURSE_ID	Course id	INT (9)	999999999	1-999999999	Y	PK	
	COURSE_STDATE	Course start date	DATE	MM/DD/YYYY		Y		
	ENROLLMENT_ENDATE	Course last date for enrollment	DATE	MM/DD/YYYY		Y		
	COURSE_DURATION	Total duration of course	VARCHAR (20)	Xxxxxxx		Y		
	COURSE_PRICE	Cost of the course	DECIMAL(4,2)		1-9999	Y		
	COURSE_DESCRIPTION	Course description	VARCHAR (500)	Xxxxxxx		Y		
	COURSE_RATING	Rating of the course on scale of 5	FLOAT (1,1)	5	0-5	N		
	UNIVERSITY_ID	Associated university ID	INT (5)	99999	1-99999	Y	FK	UNIVERSITY
	USER_ID	Associated Instructor ID	INT (6)	999999	1-999999	Y	PK/FK	INSTRUCTOR

	COURSE_LEVEL	Difficulty level of the course	VARCHAR (20)	Xxxxxxx		Y		
	COURSE_PREREQUISITE	Prerequisites for this course	VARCHAR (20)	Xxxxxxx		Y		
ENROLLS	USER_ID	User id of enrolled candidate	INT (6)	999999	1-999999	Y	PK/FK	USERS
	COURSE_ID	Enrolled course id	INT (9)	999999999	1-999999999	Y	PK/FK	COURSES
	ENROLL_DATE	Date of enrollment	DATE	MM/DD/YYYY		Y		
	ENROLL_STATUS	Status of the enrollment. completed, started, dropped...etc.	VARCHAR (10)	Xxxxxxx		Y		
	ENROLL_GRADE	Grade of the course	FLOAT (1,1)	1	1-4	Y		
	CERT_ID	Certificate id	INT (8)	99999999	1-99999999	Y	PK	
	CERT_NAME	Certificate name	VARCHAR (30)	Xxxxxxx		Y		
	CERT_ISSUE_DATE	Certificate issue date	DATE	MM/DD/YYYY		Y		

CERTIFICATIONS	CERT_VALID_DATE	Certification valid date	DATE	MM/DD/YYYY		Y		
	CERT_GRADE	Grade the student received	FLOAT (1,1)	1	1-4	Y		
	USER_ID	Certificates user id	INT (6)	999999	1-999999	Y	FK	USERS
	UNIVERSITY_ID	Certificate university id	INT (5)	99999	1-99999	Y	FK	UNIVERSITY
	COURSE_ID	Course id	INT (9)	999999999	1-999999999	Y	FK	COURSES
ASSIGNMENTS	ASSIGN_ID	Assignment id	INT (9)	999999999	1-999999999	Y	PK	
	COURSE_ID	Course id	INT (9)	999999999	1-999999999	Y	FK	COURSES
	ASSIGN_DUEDATE	Assignment due date	DATE	MM/DD/YYYY		Y		
	ASSIGN_MAXG	Assignment maximum marks	FLOAT (3,2)	100	1-100	Y		
	ASSIGN_DESC	Assignment description	VARCHAR (200)	Xxxxxxx				

	ASSIGN_ATTACH	Assignment attachment	BLOB	Xxxxxxx		N		
	ASSIGN_FEEDBACK	Assignment feedback by instructor	VARCHAR (600)	Xxxxxxx		N		
ASSIGNMENT_HISTORY	USER_ID	Users id	INT (6)	999999	1-999999	Y	PK/FK	USERS
	ASSIGN_ID	Assignment id	INT (9)	999999999	1-999999999	Y	PK/FK	ASSIGNMENTS
	ASSIGN_MARKS	Assignment marks scored	FLOAT (3,2)	100	1-100	Y		
	ASSIGN_SUBMIT_DATE	Assignment submitted date	DATETIME	YYYY-MM-DD HH:MI:SS		Y		
NOTIFICATIONS	NOTIF_ID	Notification id	INT (9)	999999999	1-999999999	Y	PK	
	NOTIF_CONTENT	Notification content	VARCHAR (350)	Xxxxxxx		Y		
	NOTIF_TIMESTAMP	Notification time stamp	DATETIME	YYYY-MM-DD HH:MI:SS		Y		
	NOTIF_TYPE	Type of notification	VARCHAR (35)	Xxxxxxx		Y		

		Ex: - Message, alret, reminder						
	NOTIF_FLAG	Notification flag EX: - Urgent, quick action .etc	VARCHAR (35)	Xxxxxxx		Y		
TARGET_AUDIENCE	USER_ID	Users id	INT (6)	999999	1-999999	Y	PK/FK	USERS
	NOTIF_ID	Notification id	INT (9)	999999999	1-999999999	Y	PK/FK	NOTIFICATIONS
	NOTIF_STATUS	Status of the notification Ex: - Read/Unread	VARCHAR (35)	Xxxxxxx		Y		
PAYMENT_DETAILS	USER_ID	Users id	INT (6)	999999	1-999999	Y	PK/FK	USERS
	USER_CARDNUM	Card number	INT (16)	Xxxxxxx		Y		
	EXP_DATE	Card expiration date	DATE	MM/DD/YYYY		Y		
	USER_CVV	Card’s CVV	INT (3)	999	0-999	Y		
	CARD_COUNTRY	Country name the card belongs to	VARCHAR (30)	Xxxxxxx		Y		
PAYMENT_HISTORY	PAY_ID	Payment id	INT (9)	999999999	1-999999999	Y	PK	

	USER_ID	Users id	INT (6)	999999	1-999999	Y	FK	USERS
	PAY_DESCRI	Payment description with courses purchased	VARCHAR (60)	Xxxxxxx		Y		
	PAY_TIMESTAMP	Payment timestamp	DATETIME	YYYY-MM-DD HH:MI:SS		Y		
	PAY_AMOUNT	Total amount paid	DECIMAL(4,2)		1-9999	Y		
PRIVACY_SETTING	SETTINGS_ID	Settings id	INT (6)	999999	1-999999	Y	PK	
	USER_ID	Users id	INT (6)	999999	1-999999	Y	FK	USERS
	SEND_EMAILS	Can send email updates or not YES/NO	CHAR (3)	XXX	YES/NO	Y		
	SHARE_LOCATION	Can use location? YES/NO	CHAR (3)	XXX	YES/NO	Y		
	SHARE_DATA	Can share user data? YES/NO	CHAR (3)	XXX	YES/NO	Y		

ENTITY RELATIONSHIP MODEL: -

Online Education Provider Database Entity Relationship Model			
ENTITY	VERB	RELATIONSHIP	ENTITY
USER	categorized as	(0:1) subtype	STUDENT
USER	categorized as	(0:1) subtype	EMPLOYEE
USER	categorized as	(0:1) subtype	INSTRUCTOR
USER	ENROLLS into	(M: N)	COURSES

USER	has ASSIGNMENT_HISTORY with	(M: N)	ASSIGNMENTS
USER	has	(0:1)	PAYMENT_DETAILS
USER	TARGET_AUDIENCE who receive	(M: N)	NOTIFICATIONS
USER	owns	(0:M)	CERTIFICATES
USER	belongs to	(0:M)	PAYMENT_HISTORY
USER	sets	(1:1)	PRIVACY_SETTINGS
UNIVERSITY	holds	(1:M)	STUDENTS
UNIVERSITY	offers	(1:M)	COURSES
UNIVERSITY	issues	(1:M)	CERTIFICATES
UNIVERSITY	employs	(1:M)	INSTRUCTORS

COURSES	consists of	(0:M)	ASSIGNMENTS
COURSES	provide	(1:M)	CERTIFICATES
INSTRUCTOR	teaches	(1:M)	COURSES
Note: - Here ENROLL, TARGET_AUDIENCE, ASSIGNMENT_HISTORY are bridge (composite) tables that are used to establish M: N relationship between their respective entities.			

Business Rules: -

USER - STUDENT: -

1. USER is a supertype which has disjointed partial completeness with STUDENT.
2. USER may or may not be categorized as STUDENT.
3. Every STUDENT must be categorized as a USER.

USER - EMPLOYEE: -

1. USER is a supertype which has disjointed partial completeness with EMPLOYEE.
2. USER may or may not be categorized as EMPLOYEE.
3. Every EMPLOYEE must be categorized as a USER.

USER-INSTRUCTOR: -

1. USER is a supertype which has disjointed partial completeness with INSTRUCTOR.
2. USER may or may not be categorized as INSTRUCTOR.
3. Every INSTRUCTOR must be categorized as a USER.

USER - ENROLL-COURSES: -

1. One USER can ENROLL into zero or more COURSES.
   - It’s not mandatory for USERs to enroll in COURSEs but ENROLL (bridge table) consists of all the USER_ID who are enrolled for COURSES.
2. One COURSES can be enrolled by zero or more USERs.
   - ENROLL (bridge table) consists of all the COURSE_IDs that are been enrolled by Users.
3. COURSES will have RATING ranging from 0 to 5 with decimal values allowed.

USER - ASSIGNMENT_HISTORY-ASSIGNMENTS: -

1. One USER has ASSIGNMENT_HISTORY with zero or more ASSIGNMENTS.
   - For a USER it’s not mandatory to have ASSIGNMENTS, but the ASSIGNMENT_HISTORY consists of all the ASSIGNMENTS USERS are associated with and maximum marks allotted to user is 100.
2. Every ASSIGNMENT has ASSIGNMENT_HISTORY with zero or more USERs.
   - An ASSIGNMENT may or may not have any USERs yet, but the ASSIGNMENT_HISTORY consists of ASSIGN_ID that are associated with USERS.

USER - PAYMENT_DETAILS: -

1. One USER can have none or one PAYMENT_DETAILS.
   - A USER may or may not fill his PAYMENT_DETAILS hence it is not necessary to mandatorily have payment details, but he is supposed to have only one PAYMENT_DETAIL.
2. Every PAYMENT_DETAILS can have exactly one USER.
3. USER_CARDNUM must not exceed 16 numbers.

USER - TARGET_AUDIENCE-NOTIFICATIONS: -

1. One USER will be TARGET_AUDIENCE to none or many NOTIFICATIONS.
    - One user may or may not receive any NOTIFICATIONS, but the TARGET_AUDIENCE have all the USER_IDs who are recipients.
2. A NOTIFICATION TARGET_AUDIENCE will be at least one or many USERs.
    - Every NOTIFICATION must be sent to at least one USER, where all the NOTIF_IDs which consists of notification details will be present in TARGET_AUDIENCE.

USER - CERTIFICATES: -

1. One USER owns none or more CERTIFICATES.
    - USER might not have any certificates yet hence it's not necessary for USERs to have CERTIFICATES, but he is eligible to have one or more certificates.
2. Each CERTIFICATE is owned by only one USER.
3. CERT_GRADE of a USER CERTIFICATE can range only between 1-4 with decimal values allowed.

USER - PAYMENT_HISTORY: -

1. One USER belongs to none or more PAYMENT_HISTORYs.
    - USER may not have made any payments yet, hence it is not mandatory to have PAYMENT_HISTORY, but he can make multiple payments.
2. One PAYMENT_HISTORY belongs to exactly one USER.
3. Here the PAY_DES will contain text of COURSE_NAME for all the courses purchased.

USER - PRIVACY_SETTINGS: -

1. One USER sets one PRIVACY_SETTINGS.
2. One PRIVACY_SETTINGS is set by exactly one USER.

    - Every USER has his own customized privacy settings, and it is different from other users. So, every USER will have only one PRIVACY_SETTINGS and vice versa.

UNIVERSITY - STUDENTS: -

1. One UNIVERSITY holds at least one or more STUDENTS.
2. One STUDENT is held by only one UNIVERSITY.
    - Every STUDENT is associated with only one UNIVERISTY at a time, hence he can belong to only one university while a university can have n number of students.

UNIVERSITY - CERTIFICATES: -

1. One UNIVERSITY issues one or more CERTIFICATES for the courses it provides.
2. One CERTIFICATE is issued by only one UNIVERSITY.

UNIVERSITY - COURSES: -

1. One UNIVERSITY offers at least one or more COURSES.
2. Each COURSE is offered by only one UNIVERSITY.
    - Every COURSE must be associated with the university which is offering that course.

UNIVERSITY - INSTRUCTORS: -

1. One UNIVERSITY employs one or more INSTRUCTORS.
2. Each INSTRUCTOR is employed by only one UNIVERSITY.

COURSES - ASSIGNMENTS: -

1. One COURSE consists of zero or many ASSIGNMENTS.
2. Each ASSIGNMENTS consists of only one COURSE.

COURSES - CERTIFICATES: -

1. One COURSES provides one or more CERTIFICATES.
2. Every CERTIFICATE is provided by only one COURSES.

INSTRUCTOR - COURSES: -

1. One INSTRUCTOR teaches one or more COURSES.
2. Each COURSE is taught by only one INSTRUCTOR.

Conclusion: -

In conclusion, the online education platform's database system will provide a robust and efficient platform for delivering quality education to users worldwide. The database will store and manage essential user, course, assignment, payment, and certification data to ensure that the platform operates smoothly, efficiently, and effectively. The online course providing system will continue to support a diverse range of academic disciplines, providing students worldwide with the opportunity to pursue their academic goals and achieve their full potential. By addressing the information needs of both students and employees, we hope to create an efficient and user-friendly experience that benefits both parties. With the increasing demand for online education, we believe that our database will play a significant role in the future of education.