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Subject: Introduction to Databases

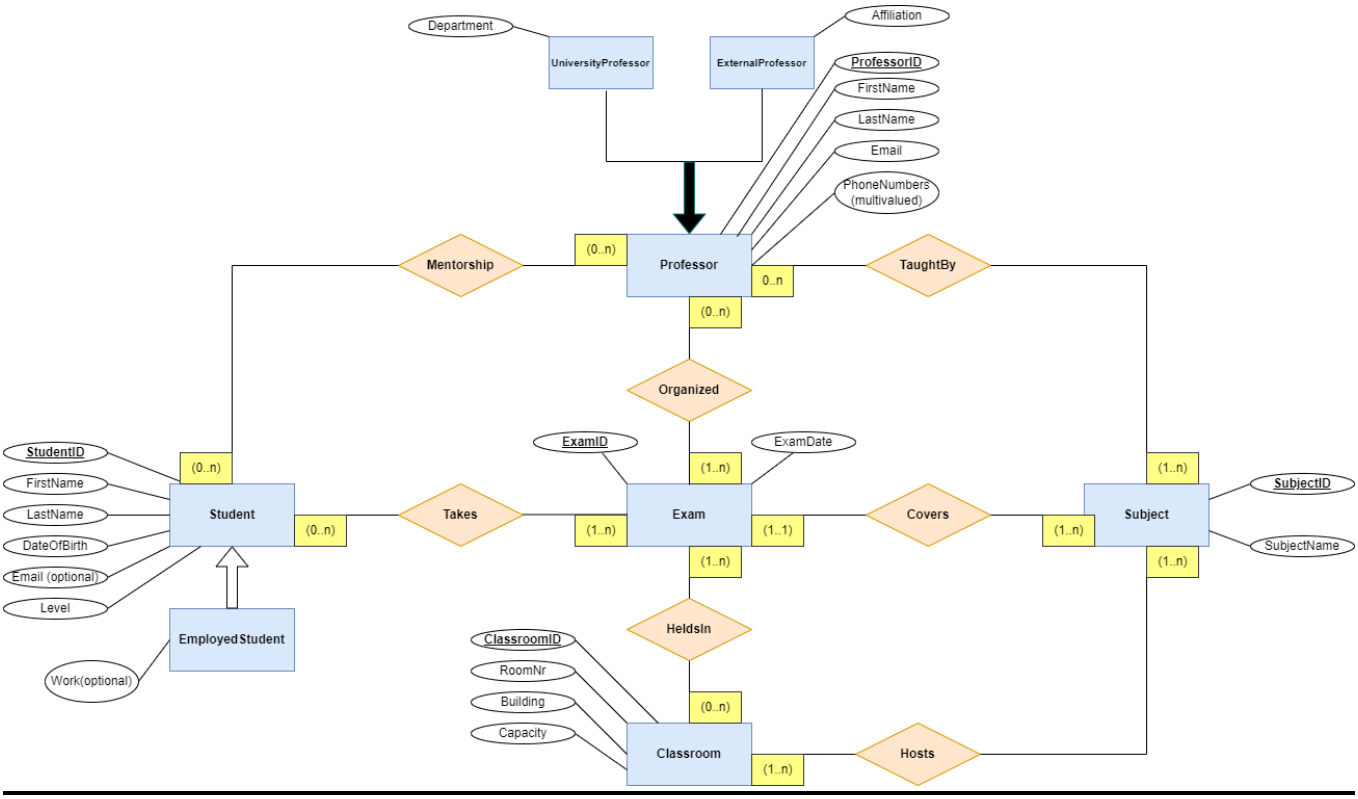
Content for Specification of Requirements:

- Textual Specification
- Entity-Relationship (ER) Diagram
- Cycles in the ER Diagram
- Table of Volumes and Operations

Textual Specification

- We want to store data about students enrolled in our institution for certain exams. For each student, we want to remember their StudentID,first name, last name, date of birth, email (optional), and their level of study (Bachelor's, Master's, or PhD). Some students might also be employed, and for these students, we want to store information about their work.
- Each student can take multiple exams. For each exam a student takes, we want to record the ExamID and date of the exam. The exam is associated with a specific subject and organized by a professor. The exam is also held in a specific classroom.
- For each exam, we want to know the subject it covers. Each subject has a unique SubjectID and name and is taught by a professor. We also need to manage classroom information, such as its ClassroomID, room number, building, and capacity.
- We also need to keep track of the professors who organize and teach various subjects. For each professor, we want to remember their ProfessorID, first name, last name, email and phoneNumbers. For UniversityProfessors we want to store the Department (e.g Computer Science…) and for ExternalProfessor we want to store their Affiliation (e.g ABC Institute…). Professors can also mentor students, and we want to keep track of these mentorship relationships.
- Additionally, we want to manage the information about classrooms. Each classroom can host multiple subjects, and we want to record which subjects are taught in each classroom.
- Professors can mentor students, providing guidance and support.

Entity-Relationship (ER) Diagram



Cycles in the ER Diagram

In the provided specification, the ER diagram contains the following cycles:

1. **Student - Exam - Subject - Classroom**
   - A student takes an exam.
   - The exam is held in a classroom.
   - The classroom hosts the subject.
   - The subject covers exams.
2. **Professor - Exam - Subject - Professor**
   - A professor organizes an exam.
   - The exam covers a subject.
   - The subject is taught by the professor.

External Constraints

Unique Exam Schedule Constraint:

- No two exams should be held in the same classroom at the same time.

Professor Exam Organization Constraint:

- A professor can only organize exams taught by himself.

Table of Volumes and Table of Operations

Volumes

Concept	Construct	Volume
Student	Entity	100
Exam	Entity	50
Professor	Entity	20
Subject	Entity	10
Classroom	Entity	10
Takes	Relationship	300
HeldIn	Relationship	50
Hosts	Relationship	50
Covers	Relationship	50
OrganizedBy	Relationship	50
TaughtBy	Relationship	50
Mentorship	Relationship	20

Operations

OP	Description	Frequency
1	Retrieve all exams taken by a student	High (daily)
2	List all subjects covered by an exam	Medium (weekly)
3	List all exams organized by a specific professor	Medium (weekly)
4	Retrieve the capacity of a classroom	Low (monthly)
5	Enroll a student in an exam	High (daily)
6	Update details of an exam	Medium (weekly)
7	Add a new professor	Low (monthly)
8	Assign a classroom to an exam	Medium (weekly)
9	Add a new subject	Low (monthly)
10	Assign a professor to mentor a student	Medium (weekly)