

# **CS 432: Databases**

## **Assignment 1: Database Design and ER Diagrams**

**Group Name: Bro Code**

**Project Name: Neev Management System**

**Here are the name & Roll no. of the Group members:**

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## 2.1 Responsibility of G1:

1. What is your database for, what will be its impact, who are the stakeholders involved, and what is the functional requirement of your database? Along with these, any other information which is necessary for your database should be mentioned in the description.

The NEEV program at IIT Gandhinagar is aimed at providing foundational education and support to underprivileged children in nearby communities. NEEV is a community outreach program of IIT Gandhinagar that empowers women and youth from underserved communities through skills development, entrepreneurship, and livelihood programs. The NEEV database, dedicated to the IIT Gandhinagar community outreach program, serves as a centralized hub for managing information related to training, mentoring, and community empowerment initiatives. It aims to enhance efficiency by tracking program participants, monitoring progress, and evaluating the impact of workforce development efforts. The database's primary impact lies in streamlining data storage and retrieval, enabling evidence-based decision-making, and measuring the success of NEEV's mission in bridging knowledge gaps.

The database for the NEEV program serves multiple purposes:

1. **Record Keeping:** It stores information about enrolled students, including their personal details, academic progress, attendance records, and any additional support they receive through the program.
2. **Resource Management:** It tracks the allocation and utilization of resources such as teaching materials, financial aid, volunteer hours, and infrastructure.
3. **Performance Evaluation:** The database facilitates the assessment of the program's impact by storing data on students' academic achievements, improvements in learning outcomes, and overall growth.
4. **Communication:** It may include features for communication between program administrators, teachers, volunteers, and parents/guardians (if any) of enrolled students.
5. **Monitoring and Reporting:** The database generates reports and analytics to monitor the effectiveness of the program, identify areas for improvement, and fulfill reporting requirements for stakeholders.

**Impact:** The database plays a crucial role in improving the NEEV program's efficiency, transparency, and accountability. It helps in better-targeting resources, tracking progress, and demonstrating the impact of the program on the lives of underprivileged children.

1. **Efficiency:** The database will streamline administrative tasks, reducing manual efforts in managing data and facilitating quicker decision-making.
2. **Transparency:** It will provide transparency in the allocation of resources and the progress of ventures, enhancing trust among stakeholders.
4. **Program Improvement:** Insights derived from the database will aid in refining the NEEV program to better serve its objectives.

## Stakeholders:

1. NEEV Members: Responsible for overall management, planning, and decision-making related to the NEEV program.
2. Teachers and Volunteers: Involved in delivering educational content, providing support to students, and maintaining records of their activities.
3. Students and Parents/Guardians: Benefit directly from the program and may access certain features like tracking academic progress or communicating with teachers.
4. Donors and Funding Organizations: Interested in the program's effectiveness and impact to determine continued support and funding.
5. Government Agencies: Might require reports and data for monitoring and evaluation purposes.

## Functional Requirements:

1. User Authentication: Different levels of access for administrators, teachers, volunteers, and other stakeholders to ensure data security and privacy.
2. Student Profile Management: Capture and update student information including demographics, academic performance, and attendance.
3. Resource Allocation and Inventory Management: Track resources such as teaching materials, funds, and volunteer hours.
4. Attendance Tracking: Record student attendance in classes, workshops, or extracurricular activities.
5. Academic Progress Monitoring: Record and analyze students' academic performance over time.
6. Communication Features: Messaging or notification system for communication between stakeholders.
7. Reporting and Analytics: Generate reports on various aspects of the program's performance and impact.

In summary, the NEEV database significantly contributes to the empowerment of youth and women in surrounding communities by facilitating efficient data management, analysis, and communication within the program.

2. Mention the questions that you asked from the respective stakeholders or individuals. Write the names of the individuals with whom you have interacted.

There were several questions that we asked the individuals present at NEEV IITGN office when we visited and they are given below:

- What exactly does the NEEV do and what is the purpose of the NEEV?
- How does the current system work?
- How do you currently track and manage participant information in the NEEV program?
- What specific data points are crucial for assessing the success of training and mentoring initiatives?
- Can you identify any challenges in the current data management process, if there are any?
- Are there some areas of improvement in the system?
- How did the students/participants participate in the training program and how did they get enrolled in the system?
- Who are the instructors for courses? How they are related to the system?
- Any other person involved in the procedure other than the students, instructors, and members of NEEV?
- How are the volunteers added to the system?
- How do you currently provide feedback or report on the progress of participants in the training sessions?
- What information do you find most useful for tailoring your training approach to individual needs?
- Are there any specific features or functionalities you would like to see in the database to enhance collaboration and communication?
- How do you feel about the current data collection process in NEEV? Is there any aspect that you find particularly helpful or challenging?
- How can the database facilitate transparent reporting on the utilization of funds and program outcomes?
- What specific technical requirements or features are essential for ensuring the security and scalability of the NEEV database?
- How is the redundant data handled currently?
- How are they measuring or tracking the process of an individual's training?

For the answers to the above questions, we reached out to the following to following:

- Adarsh Chauhan-Program Associate, (Technical NEEV IITGN)
- Roshni Patel-Senior Program Associate, ( NEEV IITGN)

## 2.2 Responsibility of G1 & G2:

### 1. Name all the entities, relationships, and attributes involved in your system.

#### Entities:

1. Course (C\_ID, Course\_name, Added\_date\_time, Details)
2. Donation (D\_ID, Donar\_name, amount, details, phone\_no, email)
  - Foreign Key:
    - i. AD\_ID [Admin Id] : Tells which admin has added the funds
3. Student (S\_ID, student\_name, email, adhar\_id, gender, photo, phone\_no, family\_background, added\_date\_time, M\_ID, stree\_no, locality, village, district, state, country)
  - Foreign Key:
    - i. M\_ID [Member Id] : Tells which member has added the student.
4. Instructor (IN\_ID, name, email, phone\_no, profession, adhar\_id, , stree\_no, locality, village, district, state, country, added\_date\_time, type, S\_ID, M\_ID)
  - Foreign Key:
    - i. S\_ID [Student Id] : student can also become an instructor, so when the type field indicates 'S' value S\_ID will be used to indicate the student.
    - ii. M\_ID [member Id] : Member can also become an instructor, so when the type field indicates 'M' value M\_ID will be used to indicate the member of neev.
5. Neev\_Member (M\_ID, name, email, adhar\_id, gender, photo, password, phone\_no, added\_date\_time)
  - Foreign Key:
    - i. AD\_ID [Admin Id] : Tells which admin has added the member.
6. Volunteer (V\_ID, name, email, adhar\_id, gender, photo, phone\_no, added\_date\_time, stree\_no, locality, village, district, state, country)
  - Foreign Key:

- i. M\_ID [Member Id] : Tells which member has added the volunteer.

7. Admin (AD\_ID, email, name, password, added\_date\_time)

### Relationships:

1. Active\_Courses:
  - The courses which are currently running involves the Courses, Student, Volunteer, Instructor entities.
2. Enroll:
  - Admin will add the members
  - Members will add the Volunteers & students
3. Become:
  - Student & Neev member can become instructor.
4. Funds:
  - Admin will add the funds of the donors.

### 2. Give examples and justification for points c to g in Design Requirements.

1. Active\_Courses:
  - a. Cardinality and participation:
    - i. Per course there will be only 1 instructor and both have partial participation in the relationship as not all instructor will be in 1 course.
      1. Course (1 - many)
      2. Instructor (1 - many)
    - ii. Per course there will be multiple students and volunteers involved in one course. Both will have the partial participation as not all students, volunteers have enrolled for the current course.
      1. Students (Many - Many)
      2. Volunteers (Many – Many)
  - b. Primary Key:
    - i. AC\_ID
  - c. Foreign Key:
    - i. C\_ID (Course ID)
    - ii. IN\_ID (Instructor ID)
  - d. Descriptive:
    - i. Start\_date
    - ii. End\_date
    - iii. No\_of\_students()
    - iv. No\_of\_Volunteers()

### 2. Enroll/Add:

Relationship	Cardinality	participation	Justification
Admin – Member	1- many	Partial – Total	As one admin can add multiple members. all the admin will not be adding the members but all members are only be added by the admin.
Member – Student	1- many	Partial – Total	As one member can add multiple students. all the members will not be adding the students but all students are only be added by the member.
Member – Volunteer	1- many	Partial – Total	As one member can add multiple volunteer. all the members will not be adding the volunteer but all volunteer are only be added by the member.
Member – Donors	1- many	Partial – Total	As one member can add multiple donors. all the members will not be adding the donors but all donors are only be added by the member.

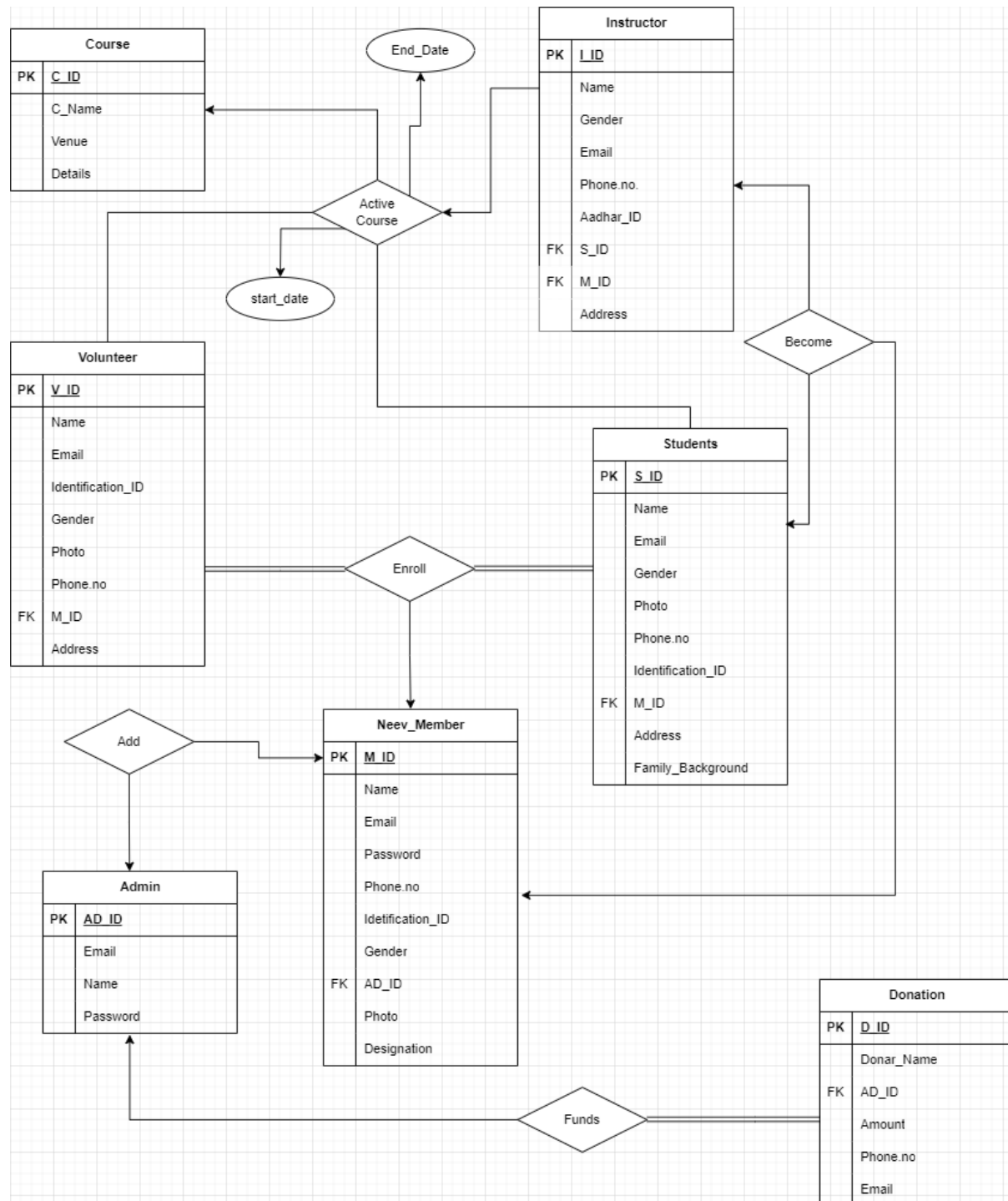
### 3. Become:

Relationship	Cardinality	participation	Justification
Student – Instructor	1-1	Partial – partial	As student can also become the instructor when type of instructor is set as s and sid will be stored in instructor relation.
Member – Instructor	1-1	Partial – partial	As neev member can also become the instructor when type of instructor is set as m and mid will be stored in instructor relation.

### 4. Fund:

Admin – Donor	1- many	Partial – Total	Admin will add the details of the funds.
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## 2.2.2 E-R Diagram for Neev Management



Link for E-R Diagram:

<https://drive.google.com/file/d/1SMMPWHGGKhRHL9hbu-cUaqp1fCa0tBug/view?usp=sharing>



## 2.3 Responsibility of Group 2

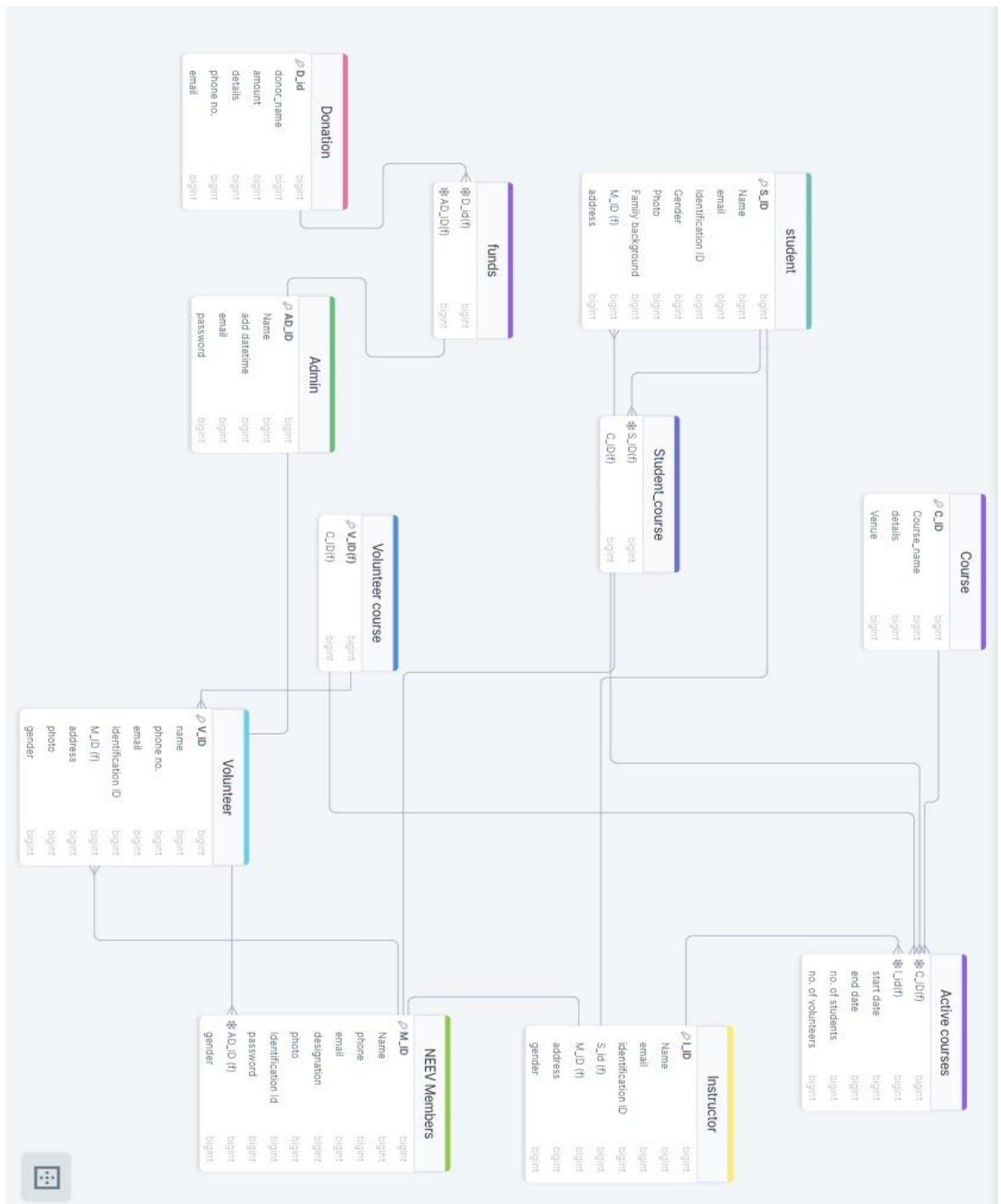
### 1) Convert the ER Diagram into Relational schemas.

Relational Schemas derived from the Strong Entity sets All the selected entity sets are strong entity sets.

1. **Student:**( S\_ID, Name, email, Identification ID, Gender, Photo, family Background, address, M\_ID(f))
2. **Donation:**(D\_ID, donor\_name, amount, details, phone no., email)
3. **Admin:** (AD\_ID, email, name, password)
4. **NEEV Members:** (M\_ID, name, email, Identification ID, gender, designation, photo, password, phone no., AD\_ID(f))
5. **Instructor:** (I\_ID, name, email, phone no., gender, Identification ID, type, S\_ID(f), M\_ID(f))
6. **Volunteer:** (V\_ID, name, email, Identification ID, gender, photo, phone no., M\_ID(f), address)
7. **Course:** (C\_ID, Course\_name, Details, Venue)

Relational Schemas derived from the relationship sets:

1. **Student course: (S\_ID, C\_ID)**  
Student (Many -1) Course(1-many)
2. **Volunteer course: (V\_ID, C\_ID)**  
Volunteer (Many- 1) course(1-many)
3. **Funds:(D\_ID, AD\_ID)**  
Donation (Many -1) Admin (1-1)
4. **Active courses:(C\_ID, I\_ID)**  
Course (1 - many) Instructor (1 - many)



2. Your design should contain primary keys and foreign keys for the schemas.

Schema	Primary Key	Foreign Key
Course	C_ID	---
Student	S_ID	M_ID
Student course	---	S_ID, C_ID
Active courses	---	C_ID, I_ID
Instructor	I_ID	S_ID, M_ID
NEEV Members	M_ID	AD_ID
Volunteer	V_ID	M_ID
Volunteer course	---	V_ID, C_ID
Funds	---	D_ID, AD_ID
Donation	D_ID	---
Admin	AD_ID	---

**3. The constraints that your schema has as key constraints (such as PRIMARY KEY, FOREIGN KEY, NOT NULL, UNIQUE, DEFAULT & CHECK) all should be listed and explained: “Why it is needed.”**

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### **1. Schema: Volunteer**

Attribute	Constraint	Why it is needed
V_ID	PRIMARY KEY	To uniquely identify users.
email, Identification ID, photo	UNIQUE, NOT NULL	These attributes cannot contain null values and must be unique
M_ID(f), Address, name, gender	NOT NULL	This attribute cannot remainnull.
phone no.	CHECK (Numeric, Length=10)	Mobile number must be of 10-digit numeric

## 2. Schema: Volunteer Course

Attribute	Constraint	Why it is needed
V_ID, C_ID	NOT NULL , FOREIGN KEY	This attribute cannot remainnull.

## 3. Schema: Funds

Attribute	Constraint	Why it is needed
D_ID, AD_ID	NOT NULL, FOREIGN KEY	This attribute cannot remainnull.

## 4. Schema: Donation

Attribute	Constraint	Why it is needed
D_ID	PRIMARY KEY	To uniquely identify users.
email, details	UNIQUE, NOT NULL	These attributes cannot contain null values and must be unique

Amount, donor_name	NOT NULL	This attribute cannot remainnull.
phone no.	CHECK (Numeric, Length=10)	Mobile number must be of 10-digit numeric

### 5. Schema: Admin

Attribute	Constraint	Why it is needed
AD_ID	PRIMARY KEY	To uniquely identify users.
Email, password	UNIQUE, NOT NULL	These attributes cannot contain null values and must be unique
Name	NOT NULL	This attribute cannot remainnull.

### 6. Schema: Active courses

Attribute	Constraint	Why it is needed
Start date, end date	UNIQUE, NOT NULL	These attributes cannot contain null values and must be unique
C_ID, I_ID	NOT NULL	This attribute cannot remainnull.

No. of Students, No. of volunteers	SIMPLE	It is useful to identify the strength of students and volunteers
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### 7. Schema: **Course**

Attribute	Constraint	Why it is needed
C_ID	PRIMARY KEY	To uniquely identify courses.
Course name, details, Venue	NOT NULL	These attributes cannot contain null values and need not be unique always.

### 8. Schema: **Student**

Attribute	Constraint	Why it is needed
S_ID, Identification ID	PRIMARY KEY	To uniquely identify and verify students using their student id and other

		identification id.
M_ID	FOREIGN KEY	This attribute is the primary key of another schema named NEEV Members.
Name, Gender, address, family background	NOT NULL	These attributes cannot contain null values, there must be a value in this attribute.
Email, Identification ID, photo	UNIQUE, NOT NULL	These attributes cannot contain null values and must be unique always.
Phone number	CHECK(Numeric, Length=10)	The phone number must be numeric and be of 10 digits.

### 9. Schema: Instructor

Attribute	Constraint	Why it is needed
I_ID	PRIMARY KEY	To uniquely identify Instructors.
S_ID, M_ID	FOREIGN KEY	These attributes are the Primarykeys of the schema Student and NEEV Members respectively.
Name, address, Gender	NOT NULL	These attributes cannot remain null.

Email id, Identification_ID	UNIQUE, NOT NULL	These attributes cannot contain null values and must be unique.
Phone no.	CHECK(Numeric, Length=10)	The phone number must be numeric and be of 10 digits.

#### 10. Schema: **NEEV Member**

Attribute	Constraint	Why it is needed
M_ID	PRIMARY KEY	To uniquely identify NEEV Members.
AD_ID	FOREIGN KEY	This attribute is the primary key of another schema named Admin.
Name, gender, Designation	NOT NULL	This attribute cannot remain null.
Email, Password, Identification_ID, photo	UNIQUE	These attributes must be unique to all the NEEV Members.
Phone no	CHECK(Numeric, Length=10)	The phone number must be numeric and be of 10 digits.

#### 11. Schema: **Student\_course**

Attribute	Constraint	Why it is needed
S_ID, C_ID	FOREIGN KEY	These attributes are the Primary keys of the schema Student and Course respectively.

4.) List all the mapping cardinalities.



Mapping cardinalities: In database design, mapping cardinalities refers to the connections between entities within a database. Different types of mapping cardinalities exist, such as one-to-one, many-to-one, many-to-many, and partial participation, to describe the relationship between entities. These cardinalities are important in maintaining the accuracy and consistency of data in the database by clearly defining the relationships between entities.

Relation	Mapping Cardinality
Student and Instructor	One To One
Neev_Member and Instructor	One To One
Admin and Donation	One to Many
Admin and Neev_Member	One to Many
Volunteer and Students	Many to many
Neev_Member and students	One to Many
Neev_member and volunteer	One to Many

**Contributions:**

**Each one from the Group discussed the problem statement and brainstormed how we can Make our Neev\_Management system more efficient and information available to the Admin all the time.**

### **Responsibility of G1**

**Q1 : Priya Darji**

**Q2 : Priya Darji , Himani Trivedi**

### **Responsibility of G1& G2**

**Q1 a: Himani Trivedi, Dhru Jain**

**b: Om Ambekar, Diya Parashar, Priya Darji**

**Q2 : Himani Trivedi, Dhru Jain, Om Ambekar, Diya Parashar, Priya Darji**

### **Responsibility of G2**

**Q1 : Om Ambekar**

**Q2 : Diya Parashar**

**Q3 : Om Ambekar, Diya Parashar, Dhru Jain**

**Q4 : Dhru Jain**

## **Individual Credits:**

- 1. Himani Trivedi: She interviewed the NEEV authorities and gathered information. She also helped in designing the rough sketch of the E-R Diagram. Helped in collecting the all the entities, relationships, and attributes. Also helped gave justification for points c to g.**

- 2. Priya Darji:** She accompanied Himani in interviewing the NEEV authorities and contributed in finding meaningful information about NEEV Management by stating the impact and functional requirements of the database of the NEEV Management.
- 3. Om Ambekar:** He created relational schema of the database, helped in finding the cardinality of the schema and contributed in finding meaningful information about NEEV Management by stating the stakeholders and purpose of the database of the NEEV Management.
- 4. Dhru Jain:** He designed the actual E-R Diagram using draw.io keeping in mind all necessary Schemas, attributes and relations. He also contributed in defining and listing the mapping cardinalities of all the relations. Also helped in listing out all types of mapping.
- 5. Diya Parashar:** She contributed by listing out the major elements of the database like the primary keys, foreign keys and also in defining the key constraints and constructing tables for the same. Lastly, she compiled the document to complete the assignment.