2.1 Conceptual Design

Requirements:

Members can register, manage their profiles (First name, Last name), set personal fitness goals, schedule, reschedule, or cancel personal training sessions with certified trainers, and register for group fitness classes.

Trainers can register, manage their profiles (First name, Last name), and input progress notes after personal training sessions,

Administrative staff can oversee personal training sessions, group fitness classes, and fitness equipment maintenance.

Assumptions:

Members, trainers, staff, and classes are assigned an ID variable that acts as their primary key.
Account creation and sign in is done using email and password for members and trainers.
Administration staff control who is allowed to register as a trainer by only allowing certain emails to register. (Certified Trainer's Emails Table)
Administration staff email and password is inserted straight into the database to "create" their account.
Date and Time variables are in the database for the scheduling parts of the requirement.
Fitness equipment needs maintenance at intervals of time (1 year, 6 months…) depending on the type of equipment.

Participation types:

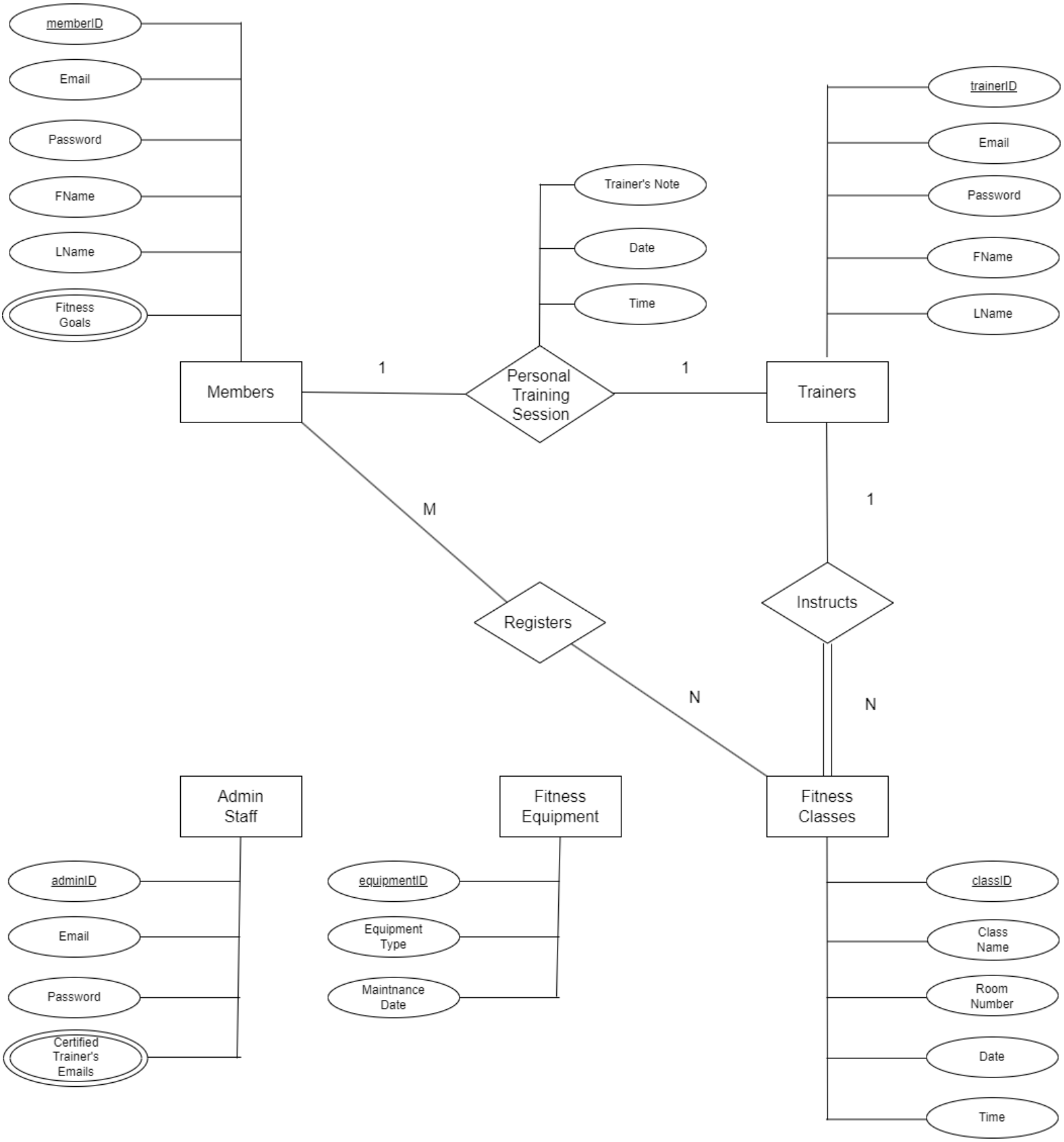
Fitness classes are total participation in the trainers instruct class relation since every class must have an instructor.
Every other relation is partial participation:

- Not all members have a personal training session with a trainer.
- Not all trainers have a personal training session with a member.
- Not all members register in fitness classes.
- Not all fitness classes have members who register.
- Not all trainers instruct a fitness class.

Cardinalities:

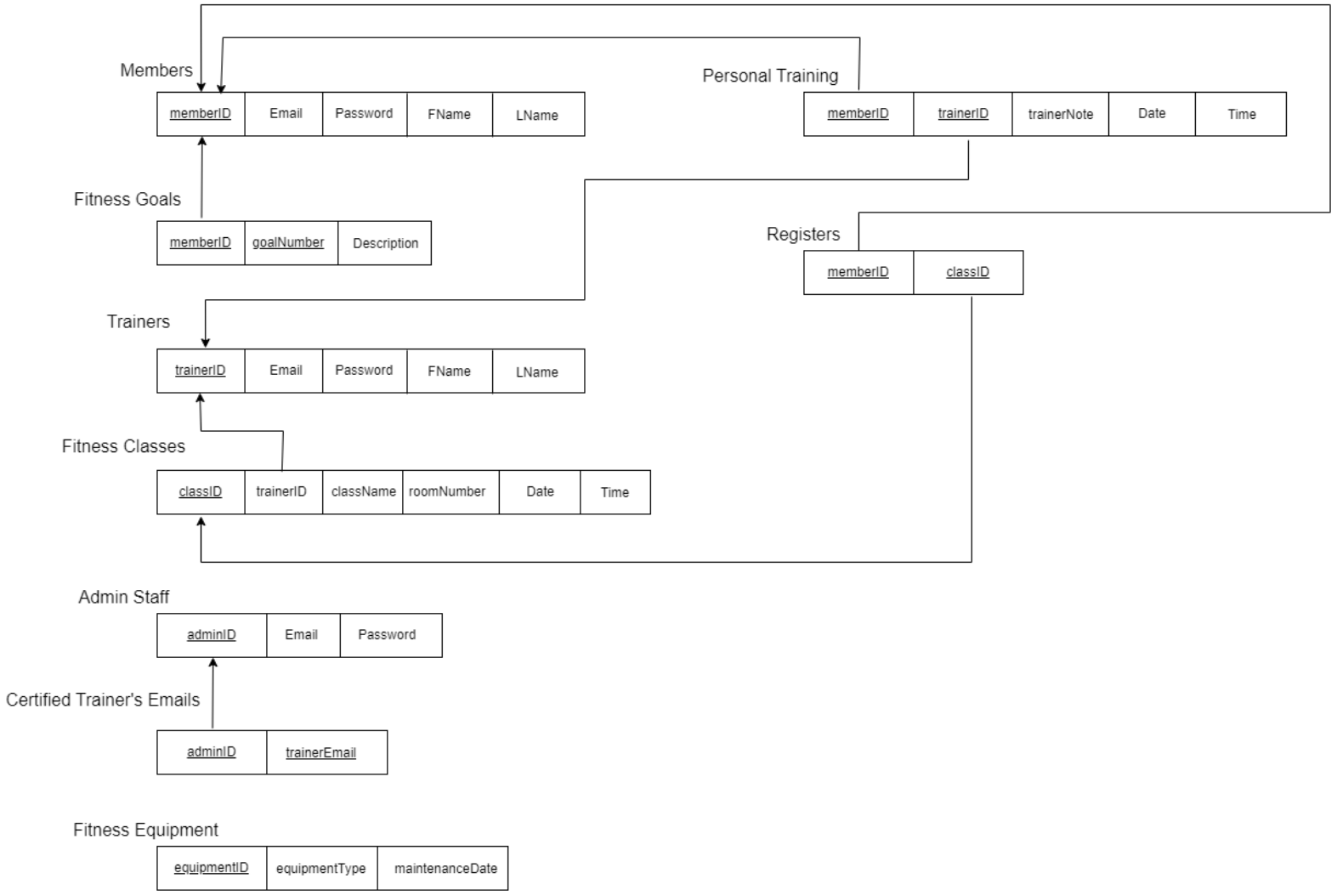
The trainers give a personal training session to members relation is one to one, one trainer teaches one member.
The members register for fitness classes relation is many to many, members can register to many classes and classes have many members.
The trainers instruct fitness classes relation is one to many, each fitness class has one trainer as the instructor.

Health and Fitness Club Management System ER Diagram



2.2 Reduction to Relation Schemas

Health and Fitness Club Management System Database Schema



2.3 Normalization of Relation Schemas

Members

memberID	Email	Password	FName	LName

Functional Dependencies:

memberID → Email
memberID → Password
memberID → FName
memberID → LName

Since none of the dependencies are partial the relation is in 2NF already.
Since none of the dependencies are transitive the relation is in 3NF already.

Fitness Goals

memberID	goalNumber	Description

Functional Dependency:
{memberID, goalNumber} → Description

Since none of the dependencies are partial the relation is in 2NF already.
Since none of the dependencies are transitive the relation is in 3NF already.

Trainers

trainerID	Email	Password	FName	LName

Functional Dependencies:
trainerID → Email
trainerID → Password
trainerID → FName
trainerID → LName

Since none of the dependencies are partial the relation is in 2NF already.
Since none of the dependencies are transitive the relation is in 3NF already.

Admin Staff

adminID	Email	Password

Functional Dependencies:
adminID → Email
adminID → Password

Since none of the dependencies are partial the relation is in 2NF already.
Since none of the dependencies are transitive the relation is in 3NF already.

Personal Training

memberID	trainerID	trainerNote	Date	Time

Functional Dependencies:
{memberID, trainerID} → trainerNote
{memberID, trainerID} → Date
{memberID, trainerID} → Time

Since none of the dependencies are partial the relation is in 2NF already.
Since none of the dependencies are transitive the relation is in 3NF already.

Registers

memberID	classID

Functional Dependencies:
(none)

Since none of the dependencies are partial the relation is in 2NF already.
Since none of the dependencies are transitive the relation is in 3NF already.

Certified Trainer's Emails

adminID	trainerEmail

Functional Dependencies:
(none)

Since none of the dependencies are partial the relation is in 2NF already.
Since none of the dependencies are transitive the relation is in 3NF already.

Fitness Classes

classID	className	roomNumber	Date	Time	trainerID

Functional Dependencies:
classID → className
classID → roomNumber
classID → Date
classID → Time
classID → trainerID

Since none of the dependencies are partial the relation is in 2NF already.
Since none of the dependencies are transitive the relation is in 3NF already.

Fitness Equipment

equipmentID	equipmentType	maintenanceDate

Functional Dependencies:
equipmentID → equipmentType
equipmentType → maintenanceDate

Transitive Dependencies:
equipmentID→ equipmentType
equipmentType→ maintenanceDate
Transitive dependency since maintenanceDate depends on the nonprime attribute equipmentType.

Decompose into new relations:

Fitness Equipment

equipmentID	equipmentType

Functional Dependencies:
equipmentID → equipmentType

Equipment Maintenance

equipmentType	maintenanceDate

Functional Dependencies:
equipmentType → maintenanceDate

Since none of the dependencies are partial or transitive, these new relations are in 2NF and 3NF.

2.4 Database Schema Diagram

Final Health and Fitness Club Management System Database Schema (1 New Table)