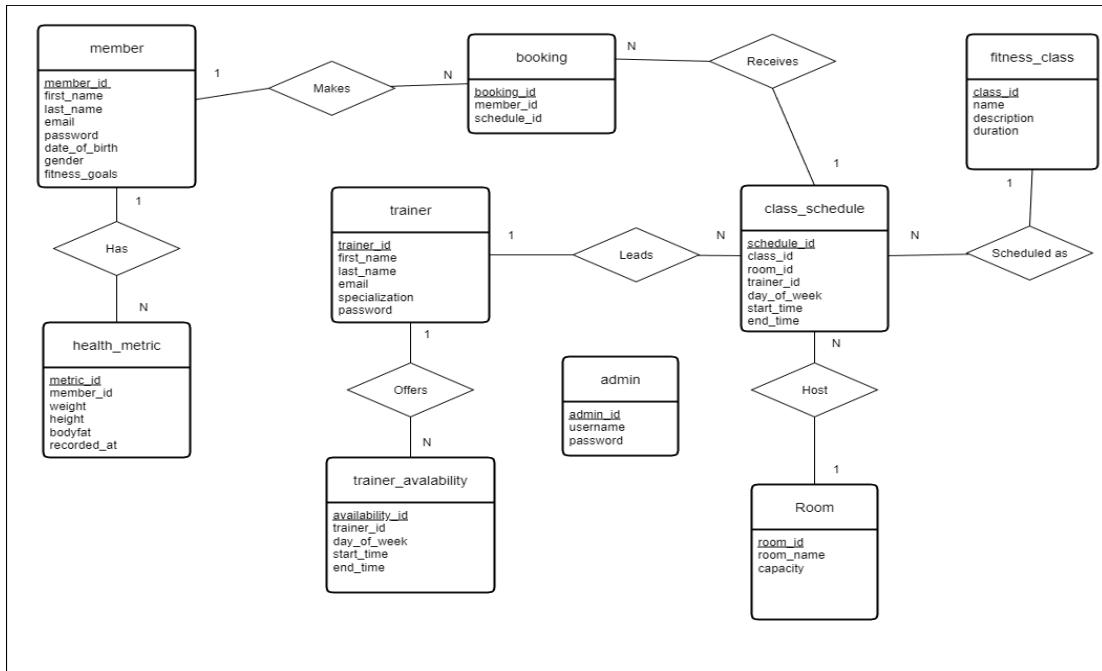
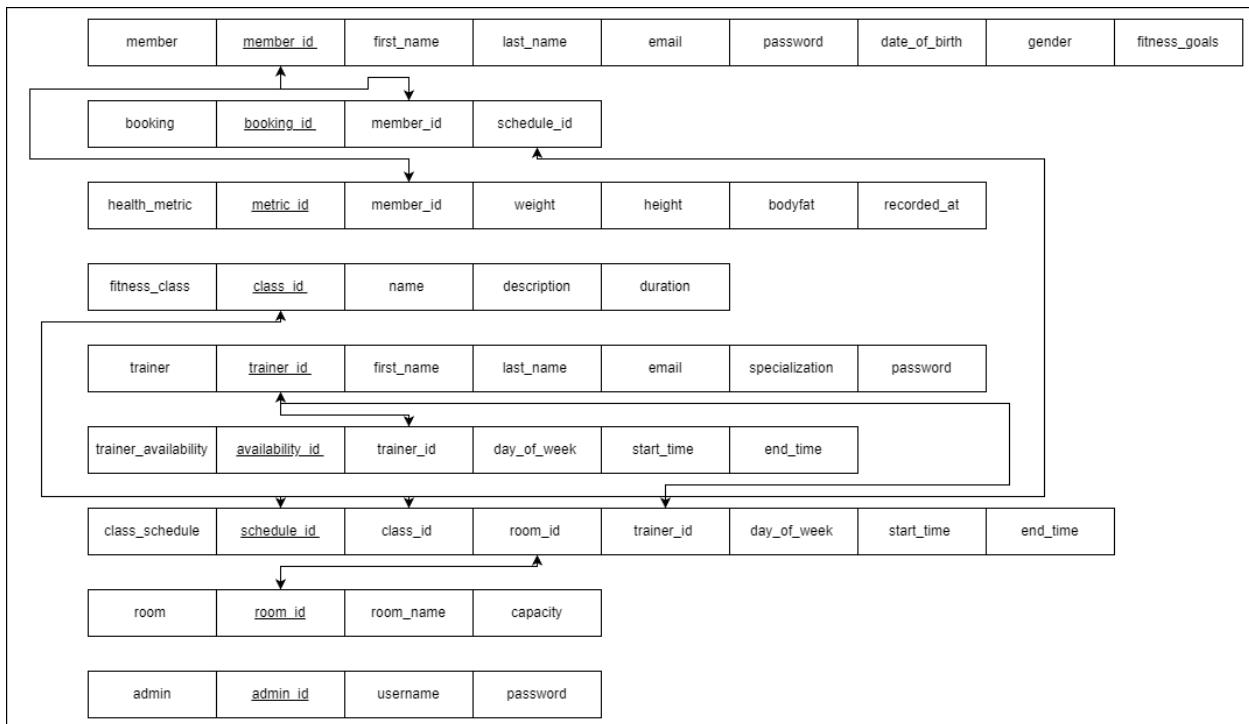


ER Model Diagram:



Relational Database Schema Diagram:



Assumptions and Mapping Tables:

Requirements	Assumption/Notes	Representation in ER Model and Relational Schema
Members has unique ID and their basic info and login are stored.	member_id is used as the primary key for easier joins and indexing.	Entity member (PK: member_id, attributes: first_name, last_name, email, password)
The system records member health metrics over time without overwriting previous entries.	Each measurement is connected to one member by member_id and has a time stamp	entity health_metric (PK: metric_id, FK: member_id, attributes: weight, height, bodyfat, recorded_at)
Trainers define their availability so classes can only be booked in free time slots.	Each availability slot is connected to one trainer	Relationship "trainer Offers trainer_availability" (1:N) entity trainer_availability (PK: availability_id, FK: trainer_id, attributes: day_of_week, start_time, end_time)
Members can book classes that are scheduled at specific times.	Each booking is connected to one member and class	Relationships "member Makes booking" and "class_schedule Receives booking" (both 1:N); entity booking (PK: booking_id, FKS: member_id, schedule_id, attribute: status)
Fitness classes are defined once and then scheduled in rooms with trainer and times.	Class like yoga can happen multiple times	Entity FitnessClass (PK: class_id, attributes: name, description, duration); Relationship "FitnessClass Has ClassSchedule" (1:N)
Rooms have limited capacity and must be managed to avoid overbooking.	Each room has capacity that is enforced by trigger.	Entity Room (PK: room_id, attributes: room_name, capacity)
Admins manage the system	Admin accounts are separate from members and trainers	Entity Admin (PK: admin_id, attributes: username, password)

Normalization:

All Tables are already in 3NF

Normalization Proof:

2NF Compliance:

All 9 tables use single-column primary keys (member_id, trainer_id, room_id, admin_id, class_id, schedule_id, booking_id, metric_id, availability_id).

All tables use a primary key therefore no table has a composite primary key, partial dependencies cannot exist

3NF Compliance:

No non-key attribute depends on another non-key attribute in any table therefor there are no transitive dependencies so it is already in 3NF

Some examples:

- Member table: email does not determine first_name, first_name does not determine fitness_goals. All attributes independently describe the member.
- HealthMetric table: weight does not determine height, height does not determine bodyfat. Each is an independent measurement of the same metric entry.
- ClassSchedule table: day_of_week does not determine start_time (multiple schedules can exist on same day at different times). Time attributes independently describe when the schedule occurs.