SNS COLLEGE OF PHYSIOTHERAPY COIMBATORE - 641035

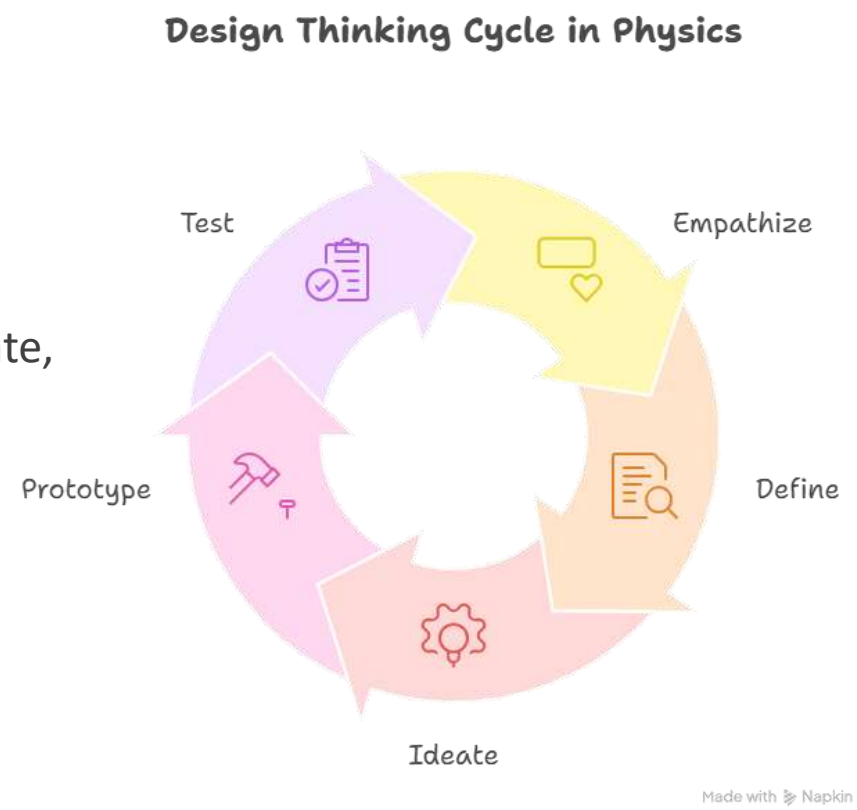
COURSE NAME: BASICS PHYSICS

TOPIC: NEWTONS LAWS

SUBJECT CODE: 746283

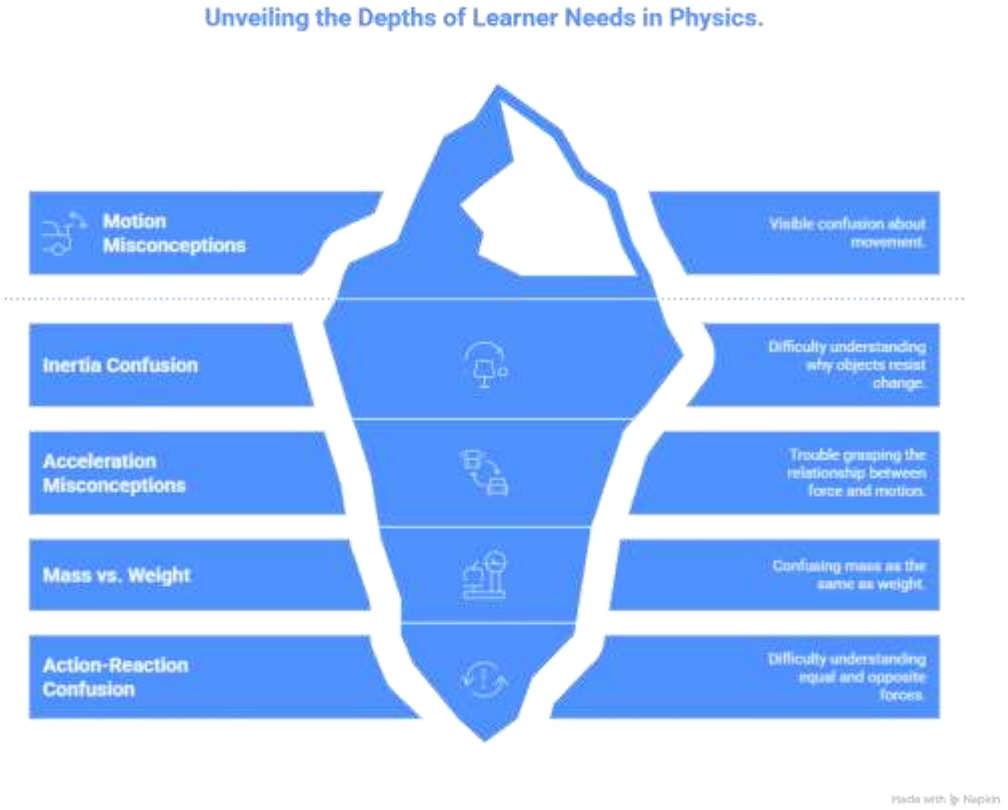
Why Design Thinking in Physics?

- Problem-based learning
- Connects laws to real-life movement
- Improves clinical reasoning
- Phases: Empathize, Define, Ideate, Prototype, Test



Understanding Learner Needs

- Why do objects move or stay still?
- Why fall forward when bus brakes?
- Is mass same as weight?
- Action–reaction confusion

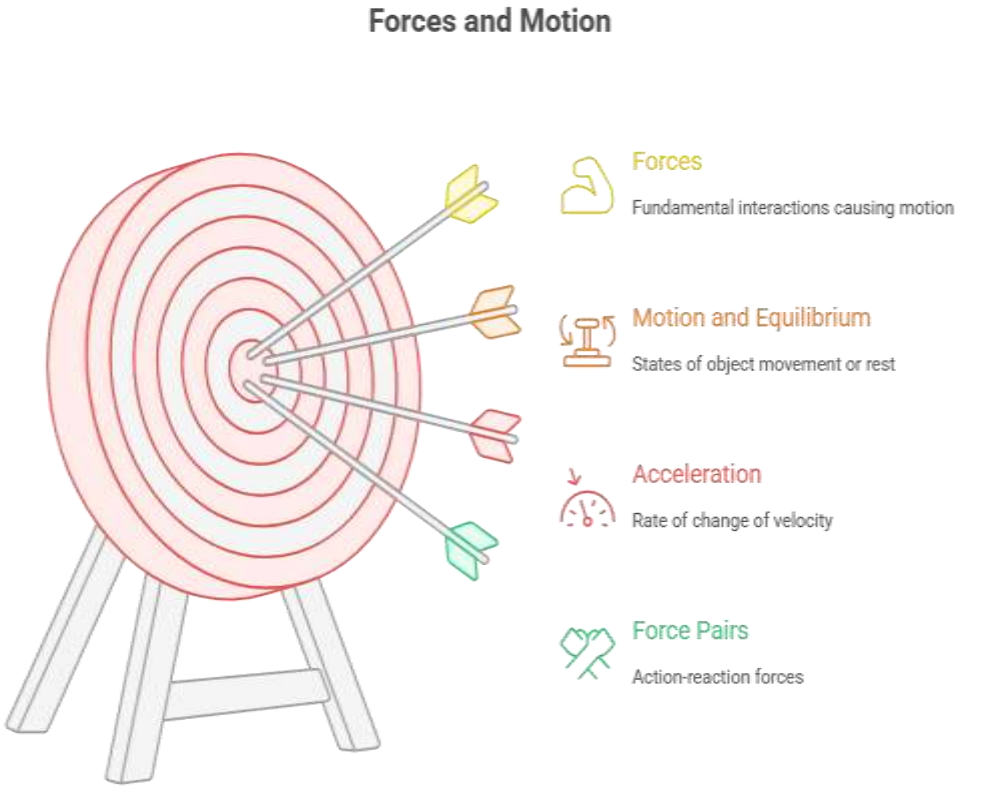


Real-World Movement Problems

- Patient balance loss while walking
- Pushing heavy vs light wheelchair
- Standing still vs slipping
- Gun recoil during firing

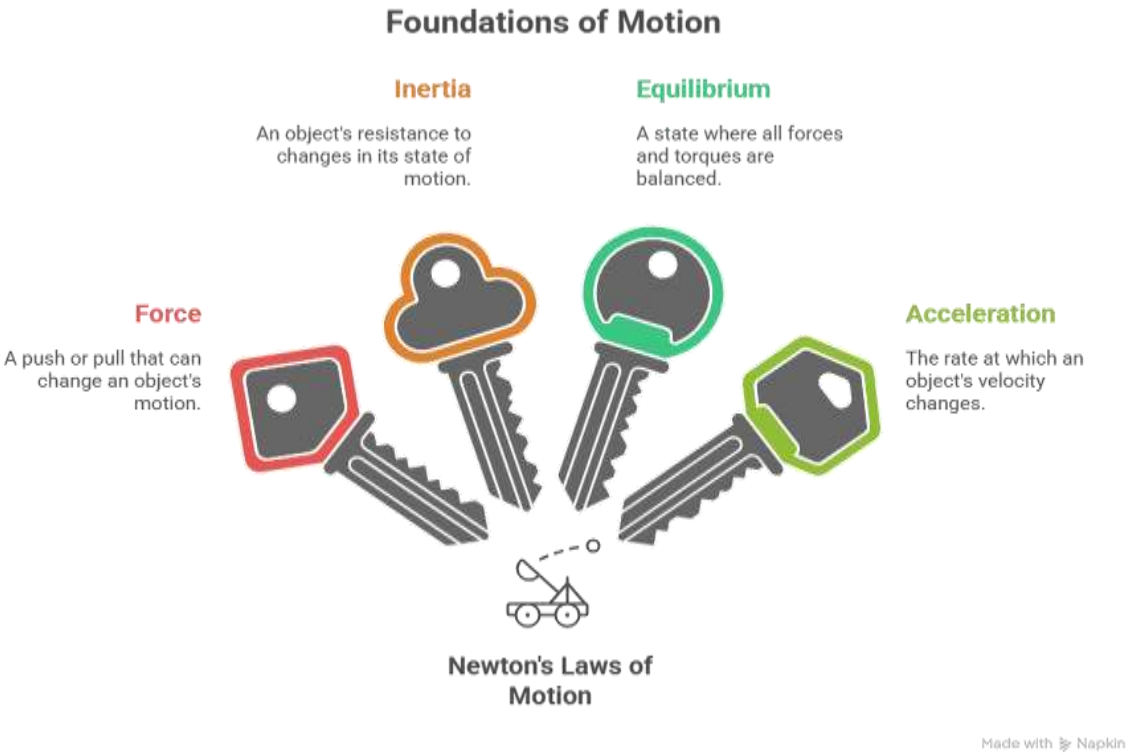
Problem Statement

- How do forces control motion and equilibrium?
- Why objects rest or move
- How forces cause acceleration
- Why forces always exist in pairs



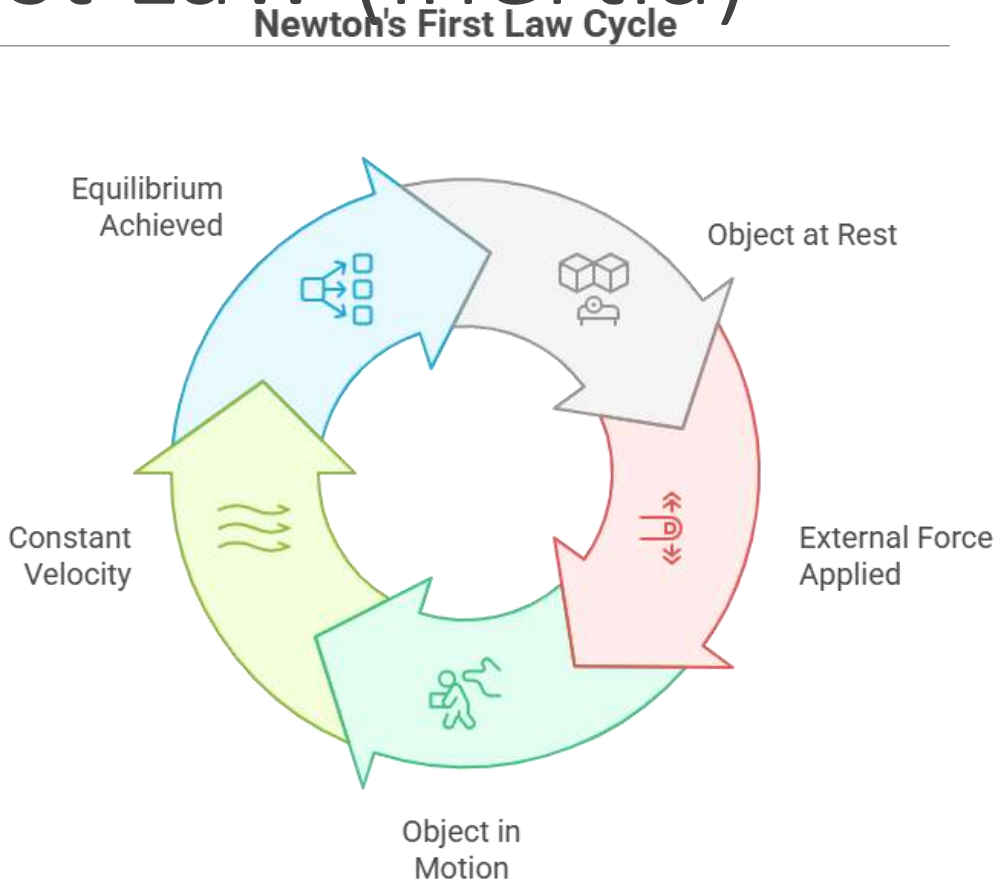
Key Definitions

- Force: push or pull
- Inertia: resistance to motion change
- Equilibrium: $\Sigma F = 0$ & $\Sigma \tau = 0$
- Acceleration: rate of change of velocity



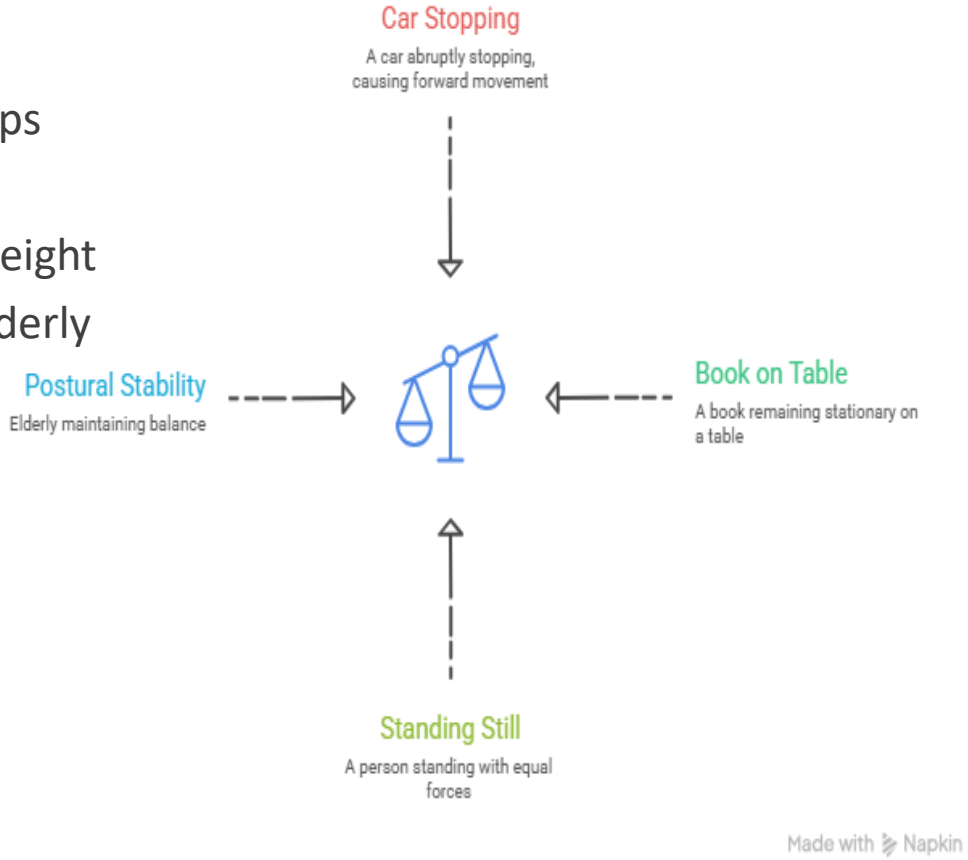
Newton’s First Law (Inertia)

- Object stays at rest or uniform motion unless external force acts
- Static equilibrium: at rest
- Dynamic equilibrium: constant velocity
- Inertia proportional to mass



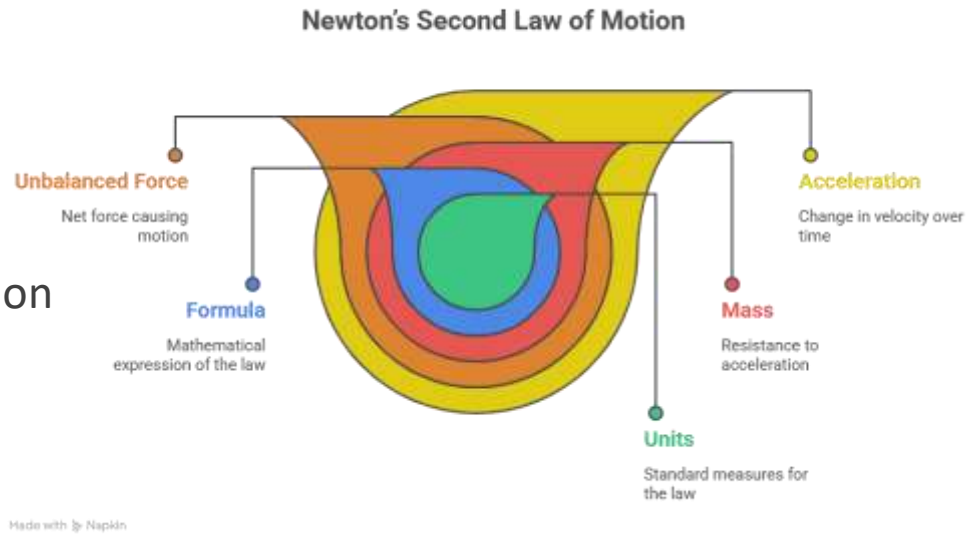
First Law Examples

- Body moves forward when car stops
- Book stays on table until pushed
- Standing still: floor force = body weight
- Clinical link: postural stability in elderly



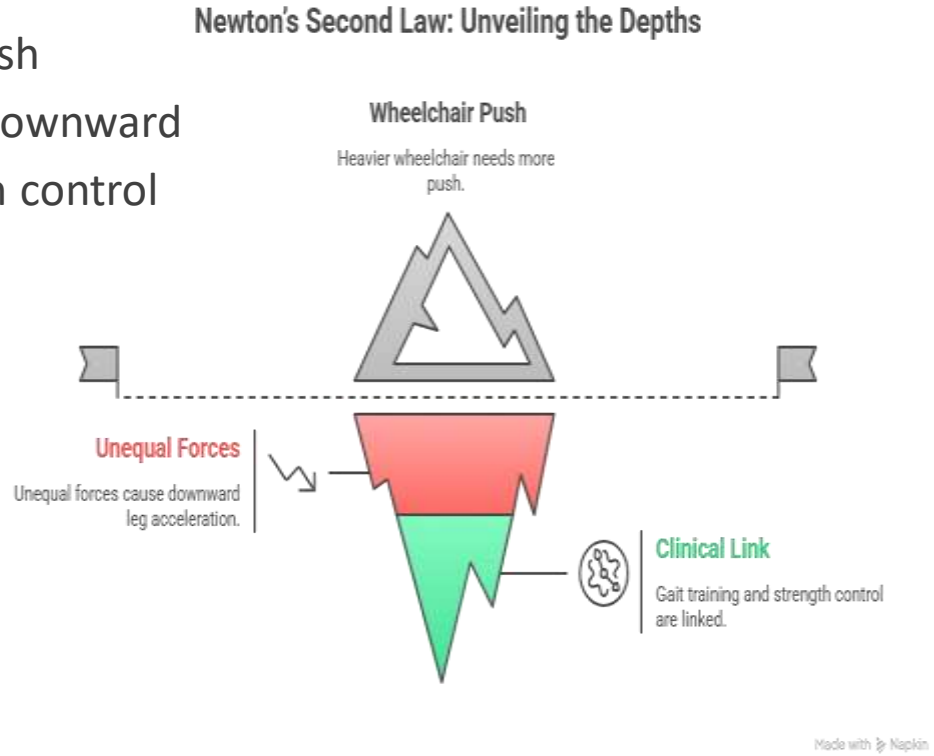
Newton’s Second Law (Acceleration)

- Acceleration ∝ unbalanced force
- Inversely ∝ mass
- Formula: F = m × a
- Units: N, kg, m/s²
- Moment of inertia: mass distribution



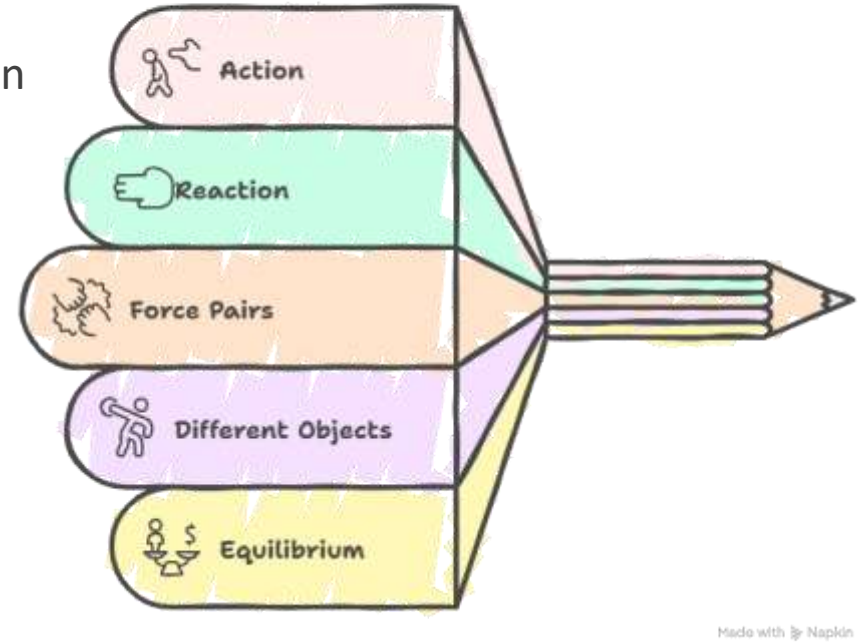
Second Law Examples

- Heavier wheelchair needs more push
- Unequal forces → leg accelerates downward
- Clinical link: gait training & strength control



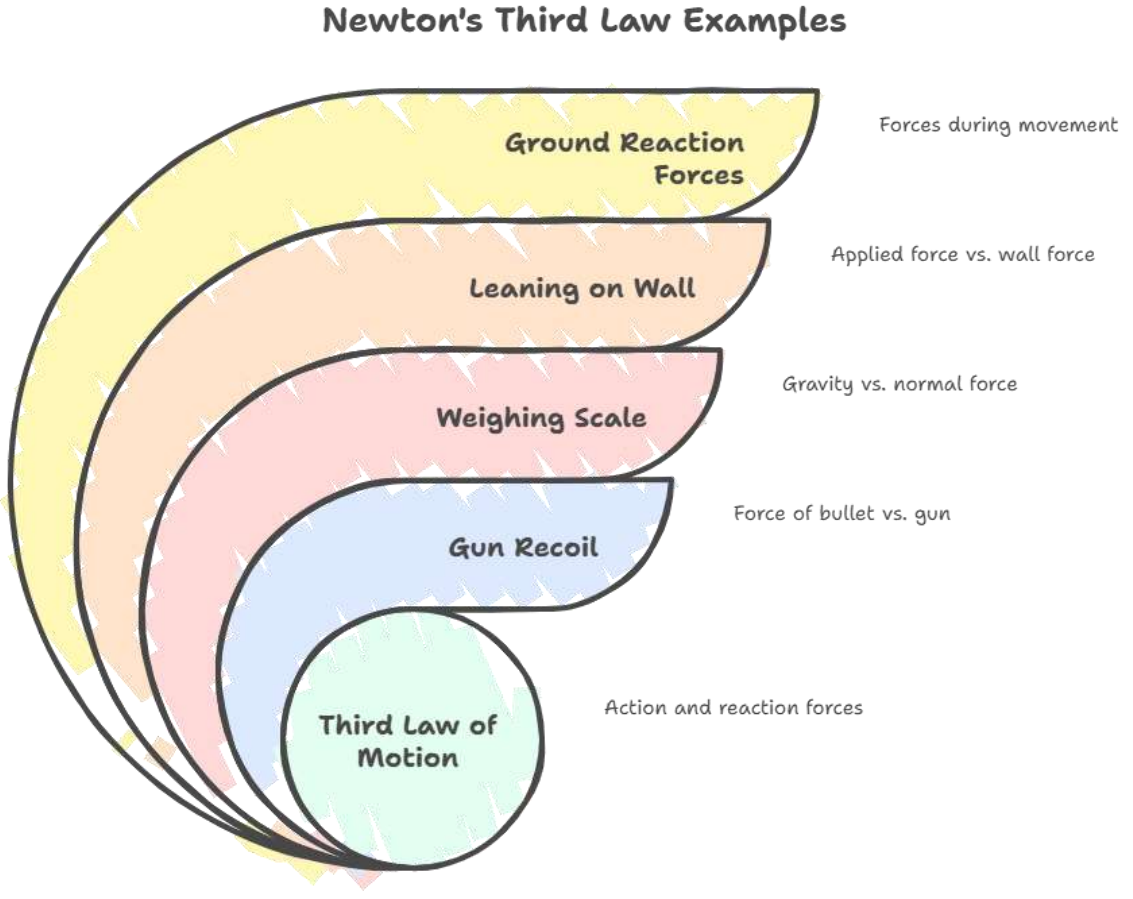
Newton’s Third Law (Action–Reaction)

- Every action → equal & opposite reaction
- Forces occur in pairs
- Act on different objects
- Not used for equilibrium of same object



Third Law Examples

- Gun recoil
- Standing on weighing scale
- Leaning on wall
- Clinical link: ground reaction forces



Hands-On Demonstrations

- Push toy car with different masses
- Lean on wall to feel reaction force
- Tablecloth pull (inertia demo)
- Walk barefoot vs ice (friction)

Quick Assessment

- What keeps moving body in motion?
- If mass increases, acceleration ____?
- Action–reaction forces act on: same/different objects
- Static vs dynamic equilibrium
- Formula for force

Conclusion & Reflection

- Newton’s laws explain human movement
- Foundation for biomechanics & physiotherapy
- Useful for balance, rehab, injury prevention
- Question: Why does a patient lose balance while walking?