1. Forces: (Continued)

B. Equilibrium state of multiple forces.

1. If there are multiple forces exerting on an object and the object is in rest or moving at constant velocity, **the total force is zero.** $\sum \vec{F} = 0$ which means $\sum F_x = 0$ and $\sum F_y = 0$

C. Normal force and friction.

1. Directions of the normal forces and frictions.
2. Static friction and kinetic friction.
3. What is the relation between friction and the normal force?

2. Newton's Laws and dynamics:

A. Newton's 1st Law:

A body at rest will remain at rest, and a body in motion will remain in motion, unless it is compelled to change its state by forces acting on it.

B. Newton's 2nd Law:

The sum of forces acting on a body is equal to its mass times its acceleration. $\vec{F} = m\vec{a}$, which means $\sum F_x = ma_x$ **AND** $\sum F_y = ma_y$

C. Newton's 3rd Law:

D. Application of Newton's Laws:

1. System in rest (equilibrium require the total force is zero)
2. System in motion with acceleration needs to apply the Newton's second Law.
4. Examples: tilted surfaces, projectile objects, object balanced with multiple forces.

3. Uniform circular motion.

Centripetal acceleration, centripetal force.
Understand the concept and the calculation.

4. Work and Energy:

A. Definition of work, power and kinetic energy. What are their units? Are they scalar or vector?

B. Work-energy theorem: $W = \Delta K = K_f - K_i$

C. How do we calculate work and kinetic energy?

Work done along by constant force only.
Work done by a force which is not at the same direction of the displacement
What about the work done by the normal force or friction?

D. Applications of work-energy theorem:

Using work-energy theorem to find out speed, displacement, etc.