Force Knowledge Tree Chart

- **Force**
  - Definition of Force
    - Definition: strength or energy as an attribute of physical action or movement.
    - 3 Elements of Force: magnitude, direction and the point of application.
    - Illustration of Force: Use a line segments with an arrow to represent force visually.
  - Common Types of Force
    - Gravitational
      - Cause: the earth attracts another object towards itself.
      - Magnitude: $G = mg$
      - Direction: "downward" towards the center of the earth.
      - Center of gravity: a point from which the weight of a body or system may be considered to act.
    - Elasticity
      - Cause: things touch and are deformed.
      - Direction: opposes to the deformation direction.
      - Hooke's law: $F = kx$
    - Friction
      - sliding friction
        - Direction: opposes the relative motion of an object
        - Magnitude: $F = \mu F_N$
      - Static Friction
        - Direction: opposes the relative motion of an object
        - Magnitude: $0 < F \leq F_{max}$
  - Resultant Force and Component Force
    - Algorithm: parallelogram rule, proper orthogonal decomposition method.
    - Resultant Force Range: $|F_1 - F_2| \leq F \leq |F_1 + F_2|$
  - Force Analysis
    - Isolation Method
    - Integrated Method