RAA04 – Checklist of things to know/review

*RAA04 Contains all information from lectures up to and including lecture 28: Spring force and potential energy. Below is a short list of important concepts to understand. The goal of this list is to help you organize your thoughts as you study. This sheet does not contain everything that we covered, just the highlights to help point you in the right direction.

- All of RAA01, RAA02, and RAA03 Checklist items
- Physical representations :
  - FBDs:
    - Be sure to define your system, and include: only external forces acting on your system, labels for each force, relative scale of each force if asked, coordinate system, relevant angles.
  - e-FBDs:
    - Be sure to define your system, and include: physical object in your system with its correct orientation as presented to you, only external forces acting on your system with their tails at the location of the force on the object, labels for each force, relative scale if asked, coordinate system, labeled reference axis "o", moment arms, relevant angles.
- Newton's three laws of motion in rotational form.
- Torque:
  - Find magnitude of torque due to a force on an object.
  - Find net torque acting on an object:
    - Qualitatively describe what this net torque does to the object.
  - Coordinate system?
- Statics:
  - Equilibrium definition.
  - Qualitative center of mass arguments.
- Momentum-Impulse:
  - Definition of momentum impulse theorem.
  - Find impulse/change in momentum/final or initial velocities from a force vs time graph.
  - Define a system consisting of multiple objects and find momentum of system.
- Conservation of momentum:
  - Define a system and determine if your system's momentum is conserved or approximately conserved.
  - "Collisions", define a system where momentum is conserved or approximately conserved and find velocities or masses based off of information about initial (before collision) and final (after collision).
  - Solve "multi-stage" problems (e.g. use conservation of momentum first, then a combo of kinematics and mechanics second).

- Work:
    - Use definition of work to find the value if given information about forces and displacements.
    - Work vs effort?
    - Positive vs negative work?
- Work-Kinetic energy theorem:
    - Apply work kinetic energy theorem to single object systems to find unknown quantities such as coefficients of friction, speed, distances, velocities…
- Gravitational potential energy:
    - Find changes in gravitational potential energy.
    - Use with updated work-kinetic energy theorem to write an "energy equation" for a system with multiple objects (e.g. mass 1 and earth system).
- Springs:
    - Hooke's law?
    - Find changes in spring potential energy.
    - Use with updated work-kinetic energy theorem to write an "energy equation" for a system with multiple objects (e.g. mass 1 and spring system).