

## Physics 1110 Topic Review List:

General Skills: Algebra, trigonometry, unit conversion, taking derivatives

Ch.2: x, v, a vs t graphs, constant acceleration formulas

Ch.1: Vector math

Ch.3: vector  $\mathbf{a}$ ,  $v_1$ - $v_2$ - $\Delta v$  diagram, 2D projectile motion

Ch.4: Newton's Laws, free-body diagrams, kinetic and static friction

Ch.5:  $\mathbf{F}_{\text{net}} = m\mathbf{a}$  problems: FBD, coordinate system,  $\sum F_x = ma_x$ ,  $\sum F_y = ma_y$

Ch.6, 7: Work and energy, KE and PE, conservation of energy, power

Ch 12: Gravity:  $F_{\text{grav}} = GMm/r^2$ ,  $g = GM/r^2$ , orbits, escape velocity

Ch.8: Conservation of linear momentum; impulse =  $\Delta\mathbf{p} = \mathbf{F}_{\text{net}} \Delta t$

Ch.9: Rotational motion:  $\theta$ ,  $\omega$ ,  $\alpha$ ; torque  $\tau = r F_{\perp}$ ;  $\tau = I \alpha$ ;  $KE_{\text{tot}} = KE_{\text{trans}} + KE_{\text{rot}}$

Ch.10: Conservation of Angular Momentum,  $\vec{L} = \vec{r} \times \vec{p}$ ,  $\vec{L} = I \vec{\omega}$ ,  $\vec{L}_{\text{tot}} = \text{constant}$  if  $\vec{\tau}_{\text{ext}} = 0$

Ch.11: Static Equilibrium:  $\sum F_x = 0$ ,  $\sum F_y = 0$ ,  $\sum \tau = 0$

Ch.13: Simple Harmonic Motion:  $\omega = 2\pi/T = \sqrt{k/m}$ ,  $E_{\text{tot}} = \frac{1}{2} m v^2 + \frac{1}{2} k x^2$

Ch.14: Fluids: density  $\rho$ , pressure  $p$ , buoyant force/Archimedes' Principle

Ch.15: Traveling waves,  $v_{\text{wave}} = \lambda f$ , Superposition Principle, standing waves

Ch. 17: Temperature and Heat: specific heat  $c$ ,  $\Delta Q = m c \Delta T$  or  $\Delta Q = m L$ , heat transfer

### To prepare for Final Exam:

- The Final exam will be 42 questions, multiple-choice, 2.5 hours long. Bring single formula sheet (standard 8.5"x11"); you can hand-write anything on both sides. Bring calculator and #2 pencil
- The Final exam will be comprehensive, covering all topics equally.
- Review Midterms I, II, and III. Review Concept Tests, Tutorial HW, and Capa Solutions. Take the old practice Final.
- It is no good to memorize answers. You have to understand and remember the strategies for getting the answers. The questions on the exam will be similar to, but never identical to, questions from old exams, concept tests, TutHW, capa.

### **Problem solving strategies.**

There are a 1000 equations in this course, but there are only a handful of problem-solving strategies.

The most important step in solving a problem is always the FIRST STEP, which is to decide what is the correct strategy for attacking the problem.

Fortunately, there are only about 5 strategies in this course:

- Problems involving forces and motion: Use  $\mathbf{F}_{\text{net}} = m\mathbf{a}$ , or the rotational equivalent  $\boldsymbol{\tau}_{\text{net}} = I\boldsymbol{\alpha}$ . Start by drawing a free-body diagram, then choose a coord. system, then write the equations.
- Before/after situations: Apply a conservation law.
  - Conservation of energy (always true, but most useful when there is no friction) or
  - Conservation of momentum (always applies, even when friction) or
  - Conservation of angular momentum (when rotations are involved).
- Constant acceleration problems. Use the constant acceleration formulas (for instance, projectile motion)
- Vector math. Example: vector1 – vector2- delta vector problems.
- Apply the definition: For instance if you are asked to compute the work done by a force, you have to know the definition of work. Or if you are asked for the moment of inertia of a mass, then you have to know the definition of moment of inertia.