Topics for 1st Semester Exam

1. Measurement & Uncertainty
   1. Significant figures
   2. SI units
   3. Orders of magnitude
   4. Estimation
   5. Propagation of uncertainties
      1. Addition of error (addition/subtraction)
      2. Addition of percentage error (multiplication/division)
      3. Exponential error (exponents)
   6. Vectors
      1. Combining vectors
      2. Vector v. scalar
2. Mechanics
   1. Kinematics
      1. Distance v. displacement
      2. Speed v. velocity
      3. Acceleration
      4. Motion graphs
      5. Uniform acceleration
         1. v = u + at
         2. s = ut + ½ at2
         3. v2 = u2 + 2as
         4. s = [(v+u)\*t]/2
      6. Projectile motion
   2. Forces
      1. Free-body diagrams
      2. Translational equilibrium
      3. Newton’s laws of motion
         1. Inertia
         2. F=ma
         3. Repulsive forces
      4. Tension
      5. Friction
         1. Static: Ff ≤ μsR
         2. Dynamic: Ff = μdR
      6. Fluid resistance (drag or air resistance) and terminal velocity
      7. Hooke’s Law (Springs): F=kx
   3. Work, Energy & Power
      1. Conservation of E
      2. Kinetic E: Ek = ½ mv2
      3. Gravitational Potential E: E = mgh
      4. Elastic Potential E (Springs): E = ½ kx2
      5. Work: W = Fs cosθ
      6. Power: P = E / t = Fv = W / t
   4. Momentum
      1. Conservation of momentum
      2. Collisions
         1. Elastic
         2. Inelastic
      3. Impulse: J = Ft = Δp
      4. Force-time graphs
3. Circular Motion & Gravitation
   1. Circular Motion
      1. Period (T) and frequency (f)
      2. Angular displacement (Θ)
      3. Angular velocity: ω = 2πf = 2π/T = θ/t = s/(rt)
      4. Centripetal force: F = (mv2)/r = (mω2)/r2
      5. Centripetal acceleration: α = v2/r = (4π2r)/T2
      6. Linear-Rotational relationships: v = ωr , a = αr, s = θr
   2. Gravitation
      1. Newton’s law of gravitation: F = GMm/r2
      2. Gravitational field strength: g = F/m
      3. Gravitational constant: g = GM/r2
4. Engineering Physics
   1. Torque: Γ = Frsinθ = Iα
   2. Moment of inertia: I = Σmr2 (dependent upon shape)
   3. Rotational Kinematics
      1. ωf = ωi + αt
      2. ωf 2= ωi2 + 2αθ
      3. θ = ωit + ½ αt2
      4. θ = (ωf + ωi) t/2
   4. Angular momentum: L = Iω
   5. Rotational kinetic energy: E = ½ Iω2
   6. Angular power: P = Γω
   7. Angular work: W = Γθ