Syllabus
Phy 152(New Version)

1. **Text:**

   The text for the class will be " Fundamentals of Physics" Vol. 2, by Halliday, Resnick and Walker(10'th ed.). Lecture summaries and homework sets will be posted on Canvas. Sometimes we will go beyond the text on certain topics, in which case detailed lecture notes will be posted on those topics .

2. **Syllabus for 152 in terms of chapters are from the text:** Chapters: 21,22, 23,24,25, 26.1-4, 27, 28,29,30.1-8, 31.1, 32.1-3, 33, 35

3. **Syllabus for 152 in terms of content:**

   (a) Electric field due to a point charge(Coulomb's Law). Computing electric field for collection of discrete charges and one dimensional continuous distributions such as rod and circular arcs with variable charge density.

   (b) Electric dipoles, dipole moments and torque and energy in an external electric field.

   (c) Gauss' Law calculations for spherical, infinite cylindrical and infinite planer geometries with variable charge densities. Flux calculation for simple geometries such as cubes and planes.

   (d) Divergence of Electric Field and Divergence Theorem applied to Electromagnetism.

   (e) Properties of conductors. Problems involving charge in a cavity.

   (f) Electric potential and calculation of potential for geometries for which electric field calculations have been done. Discussion of equipotential surfaces and curves and relationship with field lines.

   (g) Divergence, Gradient and Curl applied to electrostatics. Line integrals and path independence and electric potential.

   (h) Capacitors: Computing capacitance for parallel plate, spherical and cylindrical capacitors. Dielectrics in capacitors. Series and parallel connection of capacitors and simple two to three loop capacitor circuits.

   (i) Introduction to current and resistivity in conductors. Discussion of current density, drift speed and relationship of current density with electric field. Ohm's Law. Resistivity to resistance. Series and parallel connection of resistances and analysis of simple two or three loop resistance circuits.

   (j) RC circuit with emphasis on $t = 0$ and $t \to \infty$ behaviour. Time constant for series RC circuit.

(k) Effect of magnetic field on charges and currents: Discussion of Lorentz Force Law with application to cyclotron, mass spectrometer and Hall effect.
Discussion of magnetic dipole moment vector of planer current loops and force and torque computation for planer current loops.

(l) Biot Savart Law and calculation of magnetic field for circular arcs and straight current segments.
Ampere's Law and caclulation of magnetic field for infinite cylindrical geometries, solenoid, torus and infinite planer current distributions including variable current densities.

(m) Stokes Theorem and Ampere's Law

(n) Induction: Application of Faraday's Law to various geometries. Detailed discussion of force and torque on current loops due to induction effects.
Self induction calculation for solenoid and toroid.
Mutual induction calculation for transformer.

(o) LR circuits with emphasis on $t = 0$ and $t \to \infty$ behaviour. Analysis of two or three loop LR circuits and time constant for series LR circuit.
LC oscillation and phase. Analysis of series LC circuit.
Resonance in LRC driven circuit.

(p) Discussion of Maxwell's equations in integral and differential form, displacement current and calculating induced electric and magnetic fields for simple cases.

(q) Electromagnetic waves and wave equation. Electric and magnetic field for plane waves and Poynting vector. Radiation pressure.