Phys 102 Schedule Jan-April 2009

Week	Topics	Major Learning Goals The student should be able to:
1 Jan 5	Administration, General Properties of Nuclei, Size, Mass and Energy Units. Binding energy, Radioactive Decay Mechanisms, Half-life. Ch 43:1, 2, 5, 6	• describe the structure of the nucleus in terms of the simple nucleon model • understand the difference between, nuclide mass, atomic mass number, atomic mass • use $E=mc^2$ to determine the binding energy of a nucleus. • describe the basic types of decay mechanism and write the appropriate decay equations.
2 Jan 12	Decay Rate, Time Constant, Radioactive Dating, Formation of the Elements, Indicators for Stability, Nuclear Models, Biological Applications (NMR later). Ch 43: 3, 4, 5, 7 Review of Charge and Coulomb's Law. Ch 26:1-4 See Mastering Physics	• describe how half-life relates to decay constant and activity of a sample • know the predictors for nuclear stability • describe how radioactive materials are used in medicine • contrast the different behaviours of charged conductors and insulators • explain why a neutral object may be attracted to a charged object.
3 Jan 19	Coulomb's Law for Multicharges, Electric Field, Electric Field lines. Motion of Charges in Uniform Electric Fields. Ch 26: 4, 5 Ch 27: 1, 2, 6, 7	• apply the principle of superposition to determine the electric field due multiple charges. • appreciate the limitations of electrostatics • predict the motion of a charge in an electric field
4 Jan 26	Electric Flux, Gauss's law. Electric fields due to spherical, planar and linear charge distributions. Conductors in Electrostatic Equilibrium. Unit vectors and the Dot Product. Ch 28: 1-6 (Ch27: 3, 4) , Ch 11: 3	• apply the concept of electric flux to calculate the electric flux through different surfaces • use symmetry and Gauss's Law to predict the electric field due to some continuous charge distributions
5 Feb 2	Work done in a uniform electric field. Electric Potential and Electric Potential Energy. Equipotential surfaces, Absolute Potential, Potential due to a point charge. Potential Energy of a system of point charges. Ch 29: 1, 2, 4 - 7	• describe the relationship between electric potential energy and electric potential and to calculate their values for a system of point charges • explain what an electron volt represents
6 Feb 9	**Midterm 1** Relationship between Electric Potential and Electric Field revisited. Capacitors. Ch 27 5 Ch 30: 1, 3, 4	• determine the electric potential due to continuous charge distributions with spherical or planar symmetry • describe the relationship between equipotential surfaces and electric field . • explain how the charge of a parallel capacitor is related to the electric field and potential difference between its plates

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7 Feb 23	Equivalent capacitance. Energy stored in Capacitors, Dielectrics. Ch 30: 5 -7 Current Model, Batteries and emf Ch 30: 2 Ch 31: 1 - 5	• describe what a capacitor is and some of its applications • determine the equivalent capacitance for combinations of capacitors • explain the effect when a dielectric is inserted between the plates of a capacitor • use the charge and field model to understand the mechanism of current flow
8 Mar 2	DC Circuits, Real Batteries, Kirchoff's Laws. RC Time Constant and RC circuits. Charges in Magnetic Fields, Vector Cross Product. Ch 32: 1-9 Ch 33: 1, 2, 3, 7	• distinguish terminal voltage from emf • apply Kirchoff's laws to multiloop circuits • understand energy transfer and power loss in circuits • predict the time dependence of current, charge and potential difference for charging and discharging in an RC circuit. • predict the motion of a charge in a magnetic field
9 Mar 9	Combining Electric and Magnetic fields, Cyclotron, Hall Effect etc. Currents in Magnetic Fields. Torques: Dipoles in Electric Fields, Current loops in Magnetic Fields, NMR Ch 33: 5, 7 - 9 Ch 29: 3	• describe the operation of some common devices that use combined electric and magnetic fields • be able to calculate the torque on and potential energy of an electric dipole in an electric field and a current loop in a magnetic field
10 Mar 16	Sources of Magnetic Fields. Ampere's Law. Motional emf, magnetic flux, Faraday's Law, Lenz's Law, Eddy Currents. Inductors, LC oscillations, LR circuits. Ch 33: 3, 4, 6 Ch 34: 1- 5, 8-10	• use Ampere's Law to calculate the magnetic field due to currents in wires, loops, and solenoids • know the relationship between magnetic flux and induced emf • use Lenz's law for induced currents • predict the time dependence of current, through and potential difference across the resistor and inductor in an RL circuit
11 Mar 23	**Midterm 2** Switches in RLC circuits, AC circuits. Ch 36: 1, 2	• distinguish the terms, resistance, reactance and impedance • analyze a series *RLC* circuit and to describe how a tuning circuit works
12 Mar 30	Series RLC circuits, Power in AC circuits, Transformers Induced fields, Displacement current. Ch 36: 4 - 6 Ch 34: 6 Ch 35: 3	• determine the potential difference, impedance, current, phase angle, and power for a series RLC circuit
13 Apr 6	E and M fields interact with matter. Maxwell's Equations, Electromagnetic Waves. Review/ Applications Ch 35:1, 4, 5	• describe radiation pressure • appreciate that electric and magnetic fields are interdependent and that they can exist without source charges or currents