PH1020 syllabus

Quiz 1- syllabus: (~15 marks)

David J. Griffiths 4th edition

2.1 (Introduction, Coulomb's law, The electric field)
2.2 (Field lines, flux, Gauss's law and its applications, The divergence and curl of electrostatic fields)
2.3 (Introduction to potential, Poisson's equation & Laplace's equation, Potential of a localized charge distribution, Electrostatic boundary conditions)
2.4 (Work done to move a charge, Energy of a point charge distribution, Energy of a continuous charge distribution, Comments on electrostatic energy)
2.5 (Conductors - basic properties, induced charges, surface charge and force on a conductor)

3.4 (Approximate potentials at large distances, Monopole and dipole terms, Origin of coordinates in monopole expansions, electric field of a dipole)

4.1 (Polarisation - dielectrics, induced dipoles, alignment of polar molecules, polarisation)
4.2 (The field of polarised object - Bound charges and their physical interpretations, field inside a dielectric)
4.3 (Gauss's law in the presence of dielectrics, boundary conditions)
4.4 Linear dielectrics

Quiz 2 syllabus: (~15 marks)

5.1 (Magnetic fields, magnetic forces, currents)
5.2 (Biot-Savart law: Steady currents, magnetic field of a steady current)
5.3 (Divergence & curl of **B**, Straight line currents, applications of Ampere's law, comparison of magnetostatics and electrostatics)
5.4: Magnetic Vector Potential(5.4.1. The vector potential, 5.4.2 Magnetostatic boundary Conditions, 5.4.3 Multipole Expansion of the Vector Potential.

6.1 (Magnetization, diamagnets, paramagnets and ferromagnets; torques and forces on magnetic dipoles, effect of magnetic field on atomic orbits)
6.2 (Bound currents and their physical interpretations, Magnetic field inside matter)
6.3 (The auxiliary field H - Boundary conditions)
6.4 (Magnetic susceptibility and permeability, ferromagnetism)

7.1 (Electromotive force, motional emf)
7.2 (Faraday's law, induced electric field, inductance, energy in magnetic fields)
7.3 (Electrodynamics before Maxwell, how Maxwell fixed Ampere's law, Maxwell's equations, Maxwell's equations in matter, boundary conditions)

Post Quiz 2 syllabus: (~30 marks)

8.1.2 Poynting's theorem

9.2 (The wave equation for **E** & **B**, Monochromatic plane waves, energy and momentum in electromagnetic waves)
9.3 (Electromagnetic waves in matter: Propagation in linear media, reflection and transmission at normal incidence & oblique incidence (Snell's law))

QM syllabus

Chapter-2 Arthur Beiser [Concept of Modern Physics]
2.1 Electromagnetic Waves: Coupled electric and magnetic oscillations that move with the speed of light and exhibit typical wave behavior
2.2 Blackbody Radiation: Only the quantum theory of light can explain its origin
2.3 Photoelectric Effect: The energies of electrons liberated by light depend on the frequency of the light
2.4 What Is Light? Both wave and particle

Chapter 1. Quantum Behavior [Feynman Lecture Notes in Physics (Vol. 3)]
1-1 Atomic mechanics
1-2 An experiment with bullets
1-3 An experiment with waves
1-4 An experiment with electrons
1-5 The interference of electron waves
1-6 Watching the electrons
1-7 First principles of quantum mechanics

Chapter-3 Arthur Beiser [Concept of Modern Physics]
3.1 De Broglie Waves: A moving body behaves in certain ways as though it has a wave nature
3.2 Waves of What? Waves of probability
3.3 Describing a Wave: A general formula for waves
3.4 Phase and Group Velocities: A group of waves need not have the same velocity as the waves themselves
3.5 Particle Diffraction: An experiment that confirms the existence of de Broglie waves
3.6 Particle in a Box: Why the energy of a trapped particle is quantized
3.7 Uncertainty Principle I: We cannot know the future because we cannot know the present

3.8 Uncertainty Principle II: A particle approach gives the same result

Chapter-5 Arthur Beiser [Concept of Modern Physics]
5.1 Quantum Mechanics: Classical mechanics is an approximation of quantum mechanics
5.2 The Wave Equation: It can have a variety of solutions, including complex ones
5.3 Schrödinger’s Equation: Time-Dependent Form , A basic physical principle that cannot be derived from anything else
5.4 Linearity and Superposition: Wave functions add, not probabilities
5.5 Expectation Values: How to extract information from a wave function
5.6 Operators: Another way to find expectation values
5.7 Schrödinger’s Equation: Steady-State Form Eigenvalues and eigenfunctions
5.8 Particle in a Box: How boundary conditions and normalization determine wave functions