Tentative Course Plan

L1 Introduction
L2 Potential, Gauss Law, Poisson Equation
L3 Multipole Expansion, Spherical Harmonics
L4 Stress Tensor, Uniqueness Theorem
L5 Green’s Function, Variational Principle, Image Charge
L6 Capacitance, Force, Capacitor
L7 Electrostatics in Matter, Induced Fields
L8 Electrostatic Energy in Medium, Clausius Massotti
L9 Ohm’s Law, Circuits, Force between Current Loops
L10 Ampère’s Law, Gauge Potential
L11 Magnetic Multipoles, Magnetic Fields in Matter
L12 Faraday’s Law, Paramagnetism, Diamagnetism, Permanent Magnets
L13 Magnetic Energy, Energy in Circuits, Momentum Tensor
L14 Diamagnetism, Precession Equation
L15 Maxwell Equations, Displacement Current
L16 Polarization, Magnetization, Boundary Conditions
L17 Forces between Charges and Currents, Momentum, Energy
L18 Absorption, Wave Equation, Plane Waves
L19 Polarization
L20 Reflection and Refraction
L21 Snell’s Law, Brewster Angle
L22 Midterm
L23 Definitions in Special Relativity
L24 Proper Time, Lorentz Transformations
L25 Addition of Velocities, Four Vectors
L26 Lorentz Group
L27 Invariant Tensors, Dual Tensor
L28 Four Velocity, Action, Momentum, Force
L29 Transformation of Distribution Functions
L30 Elastic Collisions, Decay and Fusion of Particles, Invariant Cross Section
L31 Center of Mass Frame, Angular Momentum
L32 Four Current, Four Potential, Lagrangian
L33 Motion in Constant $\vec{E}$ and $\vec{B}$, Covariant Maxwell Equations
L34 Helicity and Angular Momentum
L35 Vector and Scalar Potentials, Gauge Invariance
L36 Green’s Function, Radiation
L37 Physical Radiation Fields, Radiation by slowly moving Charges
L38 Larmor Formula, $E_1$, $E_2$ and $M_1$ Radiation
L39 Weisäcker-Williams, Electric Field of Relativistic Point Charge
L40 Lienard-Wiechert Fields, Bremsstrahlung
L41 Virtual Quanta, Thomson Cross-Section
L42 Cerenkov Radiation