Guide to Exam:

Exam covers Homeworks 8 – 11 :

1. Radiation in non-relativistic systems

   (a) Multipole radiation, Larmour formula, radiation from antennas and arrays. Polarization of multipole radiation. HW8

2. Relativity.

   (a) Kinematics of relativity (length contraction *etc*), Doppler shift, particle decays HW9.

   (b) Acceleration of a particle in relativity and its transformation propoerties HW9.

   (c) Action principles and relativity, deriving equations from covariant action HW9. Covariant form of Maxwell equations.

   (d) Transformation of fields (e.g. how to boost the Coulomb field and the characteristics of this field) HW9. Physics of relativistic stress tensor, transformations under boost, HW9, HW10.

3. Relativistic Radiation

   These problems will be fairly closely related to the homework.

   (a) You should be able to write down the Green function of the wave equation. What is retarded time (formation time), in-class exercise on retarded time. L41 pg.5

   (b) Lienard-Wiechert potentials and fields.

   (c) Determining $dP(T)/d\Omega$ and $P(T)$ for relativistic motion. General features of relativistic radiation. HW10, HW11

   (d) Determine the frequency spectrum of produced light from relativistic motion HW10,HW11

$$(2\pi)\frac{dW}{d\omega d\Omega} \tag{1}$$

   (e) Bremsstrahlung spectra.

   (f) How to qualitatively describe the typical frequency produced during a given relativistic motion, with synchrotron radiation being a primary example. Formation time for relativistic radiation

4. Basics of Non-relativistic Scattering

   (a) Understand the setup of scattering problems. Defining the cross section for polarized and unpolarized scattering. Light electron scattering, and electric and magnetic dipole scattering HW11.

5. Other items

   (a) Know how to take the Fourier transform of a sequence of pulses, HW10.

   (b) Be able to make basic estimates of the sizes of atomic systems (e.g. Bohr model) without looking up numbers. HW8-Hydrogen transitions, HW11.