The Course Syllabus

1.A. Units and Definitions

- Radioactivity
- Energy

1.B. Radiation Sources

- Charged Particulate Radiation.
    - Fast Electron Sources.
    - Heavy Charged particle sources.
- Un-Charged Radiation.
    - Electromagnetic Radiation.
    - Neutrons.

2. "Aims of Particle Detectors"

- Determination of position, energy and momentum.
- Identification of particle type (determination of mass).
- Overview of a large experiment in particle physics.

3. Interaction of charged particles with matter

- Impulse approximation.
- Limits on the impact parameter.
- Energy loss by excitation and ionisation.
- Bethe-Bloch formula. The density effect.
- Mean energy loss as a function of velocity.
- Range of slow particles.
- Fluctuations in energy loss - Landau and Vavilov theories (brief).

4. Detectors relying on ionisation & excitation

- Scintillation counters and photomultipliers.
    - Time-of-flight.
- Gaseous detectors.
- Ionisation chambers
    - Proportional counters

- drift chambers
- [Streamer chambers, spark chambers and flash tubes.]

4. Detectors relying on ionisation & excitation (Cont'd)
   - Momentum measurements in a magnetic field.
   - Semiconductor detectors
     - Hodoscopes
     - Microstrips
     - CCDs.
   - Bubble chambers.

5. Coherent effects for charged particles
   - Cherenkov radiation.
   - Cherenkov detectors.
   - Threshold and ring-imaging detectors.
   - Transition radiation detectors.

6. Interactions of electrons and photons with matter
   - Bremsstrahlung.
   - Photo-electric effect.
   - Compton scattering.
   - e+ e- pair production.

7. Electromagnetic calorimetry
   - Electromagnetic showers.
   - Electromagnetic detectors.
   - Energy measurement.

8. Hadronic Calorimetry
   - Hadronic showers.
   - Hadronic detectors.
   - Fluctuations and resolution. Compensation.
   - Combined electromagnetic & hadronic calorimeters.