Beam Instrumentation Course
By Dr. Peter Forck, GSI, Darmstadt, Germany

The course gives an overview of the most frequently used beam diagnostics instruments at electron and proton accelerators, both for LINACs and synchrotrons. This covers a wide range of devices based on different physical principles. The device design and their applications for their usage during regular operation and dedicated accelerator physics investigation are discussed.

The outline of the talk is orientated on the beam quantities:

1. Beam Current Measurements are performed by transformers, Faraday cups and particle detectors.
2. Beam Profile Measurements are performed by various methods, like scintillator screens, SEM-grids, wire scanners, residual gas monitors and synchrotron radiation monitors.
3. Transverse Emittance Measurements use destructive devices or reconstruction by quadrupole magnet variation.
4. The principle Beam Position Monitors (BPM) for beam position measurements is discussed. These BPM are used for position as well as tune or further lattice function determinations at synchrotrons. Moreover, BPM are a part of a feedback system used for beam stabilization.
5. Longitudinal Measurements of momentum spread and bunch structure using picks-ups, particle detectors or synchrotron radiation is discussed. Moreover, short bunch determination by electro-optical methods is covered.
6. Beam Loss Detection for beam alignment and machine protection.

The principles and application of these instruments are discussed.

RF course
By Dr. Francis Perez, ALBA, Spain

The course gives an overview of the most frequently used RF facilities at electron LINAC and Synchrotron. This covers a wide RF facilities based on physical principles and their applications for their usage during regular operation.

The outline of the talk is orientated on the beam quantities:

1. Technical Notes on Cavities and waveguide systems
2. Technical Notes on High Power amplifier
3. Technical Notes on Low Level RF
4. Technical Notes on LINAC RF Systems
5. Technical Notes on Instabilities and Feedback Systems

Prerequisites: A good knowledge of general physics is required, as well as basics in accelerator realization and operation. The first year university mathematics is presumed, including matrix calculus, Fourier transformation and complex numbers. Most important is a high level of interest in accelerator science and application.