

**Title:** Accelerators

**Lecturer :** Dr Elias Metral

**Date and Times:** 5<sup>th</sup> July at 11:15  
6<sup>th</sup> July at 11:15  
9<sup>th</sup> July at 09:15  
10<sup>th</sup> July at 09:15  
11<sup>th</sup> July at 10:15

**Summary of the proposed talk:**

- 1a) Introduction and motivation
- 1b) History and accelerator types
- 2) Transverse beam dynamics
- 3a) Longitudinal beam dynamics
- 3b) Figure of merit of a synchrotron/collider
- 3c) Beam control
- 4) Main limiting factors
- 5) Technical challenges

**Prerequisite knowledge and references:**

- Previous knowledge of accelerators is not required.

- References (See also the Summer Student Lectures of last year from Oliver Bruning):

- 1) M. Martini, An Introduction to Transverse Beam Dynamics in Accelerators, CERN/PS 96-11 (PA), 1996, <http://doc.cern.ch/archive/electronic/cern/preprints/ps/ps-96-011.pdf>.
- 2) L. Rinolfi, Longitudinal Beam Dynamics (Application to synchrotron), CERN/PS 2000-008 (LP), 2000, <http://doc.cern.ch/archive/electronic/cern/preprints/ps/ps-2000-008.pdf>.
- 3) Theoretical Aspects of the Behaviour of Beams in Accelerators and Storage Rings: International School of Particle Accelerators of the 'Ettore Majorana' Centre for Scientific Culture, 10–22 November 1976, Erice, Italy, M.H. Blewett (ed.), CERN report 77-13 (1977) [http://preprints.cern.ch/cgi-bin/setlink?base=cernrep&categ=Yellow\\_Report&id=77-13](http://preprints.cern.ch/cgi-bin/setlink?base=cernrep&categ=Yellow_Report&id=77-13).
- 4) CERN Accelerator School <http://cas.web.cern.ch/cas/>.
- 5) K. Schindl, Space Charge, CERN-PS-99-012-DI, 1999 <http://doc.cern.ch/archive/electronic/cern/preprints/ps/ps-99-012.pdf>.

- 6) A.W. Chao, Physics of Collective Beam Instabilities in High Energy Accelerators, New York: Wiley, 371 p, 1993 <http://www.slac.stanford.edu/~achao/wileybook.html>.
- 7) Web site on LHC Beam-Beam Studies <http://wwwslap.cern.ch/collective/zwe/lhcbb/>.
- 8) Web site on Electron Cloud Effects in the LHC <http://ab-abp-rlc.web.cern.ch/ab-abp-rlc-ecloud/>.

## **Biography-**

### ***Brief CV:***

#### **Dr Elias Metral**

- PHD "Coupled Landau Damping of Transverse Coherent Instabilities in Particle Accelerators" in 1999.
- Accelerator physicist of the AB/ABP/LIS section of Gianluigi Arduini.
- Expertise: Collective effects.
- Supervisor of the SPS machine since this year (supervisor of the PS before).
- Coordinator of the machine studies in the PS & SPS complex.
- Referee for the journal PRSTAB (Physical Review Special Topics Accelerators and Beams).