ICTP DIPLOMA PROGRAMME IN EARTH SYSTEM PHYSICS 2012-2013

Physics of the Solid Earth (ESP-PSE)

(12 lectures : 18 hrs)

1- Goals of the course. Importance of Physics of the Earth Interior. Applications.

2- Structure of the Earth and Plate tectonics

3- Global and regional geodnamics

4- Electric, Magnetic, gravity Earth fields in comparison. Gravity-Solid Earth coupling. Gravitative effects in Earth evolution.

5- Measurement of the Earth gravity field. Gravimeter; absolute and relative measurements; setup of field campaign.

6- Measurement of Earth magnetic field. Magnetometer. Total field observation, three component instruments, setup of field campaign. Examples of magnetic map. Differences and common features to gravity map.

7- Satellite observations. Altimeter; gravity-magnetic missions, latest gravity field mission GOCE, next mission.

8- Spherical harmonic expansion of gravity field. International ellipsoid. Anomalous field. Analogy to magnetic field.

9- Physical properties of rocks, density, seismic velocity, susceptibility. Correlation of different parameters. Temperature and pressure dependence. Curie Temperature.

10- Lithospheric flexure model, effective elastic thickness, flexural rigidity, local isostatic compensation, mantle visosity.

11- Examples of lithospheric flexure. Crustal thickening at orogens. Crustal thinning. Postglacial uplift and subsidence.

12- Setup of a lithospheric density and susceptibility model. Physical constraints. Conditioning of solution.

Textbooks of reference:

The Solid Earth - Second Edition: An introduction to Global Geophysics by *C. M. R. Fowler - Cambridge Univ. Press*

Fundamentals of Geophysics, by *W. Lowrie - Cambridge University Press*

Watts A.B. – Isostasy and Flexure of the Lithosphere, Cambridge University Press, 2001.Blakely R.J. – Potential theory in Gravity and Magnetic Applications, Cambridge University Press, 1996.