Virtual Institute of Physics

Office address: High Energy Physics Institute of Tbilisi State University
9 Univesity street, GE-0186, Tbilisi, Georgia, Tel.: (+99532) 18-73-17, Fax: (+99532) 18-98-52

Lectures on:	**Selected topics in hadron physics**
by:	**Akaki Rusetsky (University of Bonn, Germany)**
will be held in the:	**Lecture hall of „Kvali“ association** 2nd block of Tbilisi State University, 3 Chavchavadze Ave.
time:	**Tuesdays 12:00** (lectures) **Thursdays 12:00** (exercises)

Master students are invited to attend
Course language: English/Georgian at the discretion of the audience

1. Background information: analytic properties of the Feynman diagrams
   - A short introduction to analytic functions
   - Two-point function at one loop: Kaellen-Lehmann representation
   - Cutkosky's rules
   - The scattering amplitude

2. Effective field theories
   - Integrating out of a heavy scale
   - Lagrangian and counting rules
   - Loops
   - Role of the symmetries

3. Symmetries of QCD
   - Symmetries of the massless QCD and Ward identities
   - Axial anomaly and the mass of eta'
   - Quark condensate and GOR relation

- Scale anomaly, confinement and and the mass of the nucleon

4. Chiral perturbation Theory
   - Lagrangian of ChPT in the pion sector
   - Loops and power counting
   - Pion mass at one loop
   - Pion decay constant
   - Including weak and electromagnetic interactions
   - 1-nucleon sector: the Lagrangian
   - Nucleon mass and the sigma-term
   - Pion-nucleon scattering
   - Wess-Zumino-Witten term

5. Non-relativistic effective theories
   - Strong sector
   - Non-relativistic QED and bound states