Doctoral Program: Energy

Doctoral Course: Modelling of Turbulent Dispersed Flows (28 hrs)

Lecturer: Professor Alfredo Soldati, University of Udine, Italy (http://158.110.32.35/epfl-course.html)

Seminars by Dr. Abdel Dehbi, Paul Scherrer Institute, CH

Motivation: Turbulent dispersed particle flows play a part in several technological areas. Since the individual particle motion can involve the transport and exchange of mass, momentum and heat with the carrier fluid, insights into detailed physics of this motion and how it influences and is influenced by its surroundings can lead to significant technological advancements.

Object: cover the current methodologies for predicting turbulent dispersed flows. Specific attention will be devoted to the fundamental modelling aspects and to the physical phenomena involved. In particular, i) Fluid particle interactions including particle exchanges of momentum, heat and mass with the fluid. ii) Turbulence structure and the several simulation methodologies including assumptions and modelling. iii) Some issues related to the computational aspects will be discussed.

Extra Activities: To focus the students to on the described issues, small hands-on-computer projects and seminars on specific applications and issues will be given. The course will be addressed to PhD students in Engineering and Applied Sciences.

Location: The course will be held in room ME G0 570 (except for the first week for which the room will be announced by e-mail) with the following schedule:

1. Wednesday May 7: 14 pm to 17 pm Introductory seminar. Fundamentals on Stokes flow around a sphere.

2. Wednesday May 14: 14 pm to 17 pm Forces acting on a sphere. Steady and transient forces

3. Wednesday May 21: 14 pm to 17 pm Heat and Mass transfer from a sphere.

4. Wednesday May 28: 14 pm to 17 pm Special topics on PDF approaches: Dr Abdel Dehbi, PSI.

5. Wednesday June 11: 14 pm to 17 pm Particle dispersion in synthetic turbulence. Project description

6. Wednesday June 18: 14 pm to 17 pm Particle Turbulence Interactions. Are particles a compressible flow?

7. Wednesday June: 25 14 pm to 17 pm Project Discussion.

8. Wednesday July: 2 14 pm to 17 pm Final Remarks.