Measurement techniques and data processing for scientific research in engineering disciplines

Parma, 15-17 December 2021

General info

Link to registration form:
https://docs.google.com/forms/d/e/1FAIpQLScfUqltJQoYlbWddjxC8_jaT9_1szbtQksFgjDlRxAkfQ3kvQ/viewform?usp=pp_url

The Registration is free of charge. Meals are not included.

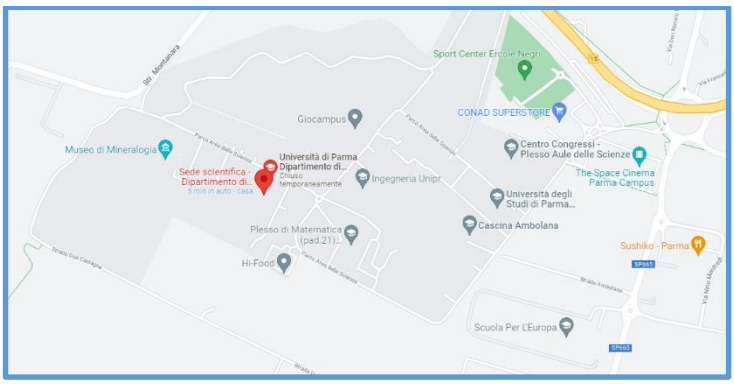
Participation is limited to a total of 8 students.

Language: English/Italian.

The green pass is mandatory and the current legislation on Covid-19 will be respected.

Venue

The lessons will take place at the Department of Engineering and Architecture of the University of Parma (in the classroom and at the hydraulics laboratory)



Contents

The course is structured in two parts: theory and lab experiments.

The theory lectures cover the following subjects: measurement system and measurements of physical quantities, with particular reference to hydraulics. Errors classification and propagation rules. Monte Carlo uncertainty propagation. Accuracy and precision of instruments. Static calibration of instruments. Operating principles of the instruments used in lab.

The experimental activities are focused on the following subjects: displacement measurements with ultrasound probes. Flow measurements with turbines, pressure transducers. Control of cameras and shutter synchronization with respect to external triggers, etc. Basic programming in LabView.

Detailed Program

Wednesday 15 December

10:00-10:45 - Welcome to the participants and presentation of the course

11:00-13:00 - Measurement systems and introduction to error analysis

14:30-16:15 - Introduction to LabView

16:30-18:30 - Static calibration of an instrument (in the laboratory)

Thursday 16 December

08:45-10:45 - Signal processing and outlier removal. Monte Carlo uncertainty propagation

11:00-13:00 - Practice in the laboratory

14:30-16:15 - Working principle of some instruments (not only) used in the hydraulics laboratory

16:30-18:30 - Practice in the laboratory

Friday 17 December

08:45-10:45 - Acquisition triggering and camera synchronization

11:00-13:00 - Practice in the laboratory

Recommended texts:

- Misure e Controlli Idraulici (2006), Longo S., Petti M., McGraw-Hill Italia, Collana di Istruzione Scientifica, serie di Ambiente e Territorio.
- Strumenti e metodi di misura (2004), Doebelin, E.O., Mc Graw-Hill, 2004.
- Introduzione all'analisi degli errori : lo studio delle incertezze nelle misure fisiche (2000), Taylor, J.R., Zanichelli.

Course Lecturer

Dr. Luca Chiapponi

Luca Chiapponi was born in Parma on June 14, 1979. He graduated in Environmental Engineering in 2006 and discussed his Ph.D. thesis in 2010 (University of Parma). He works in Parma at the Department of Civil Engineering, especially in the laboratory of hydraulics covering design and executive roles. His research interests include turbulence at the fluid-gas interface, water waves generation by wind, transport of non-Newtonian fluids in porous media, gravity currents, water retention in artificial porous media. The main experimental skills include: rheological measurements, LDA flow velocity measurements (2D and 3D); hot film/wire anemometry; Particle Image Velocimetry (2D PIV, Stereo PIV, volumetric particle tracking); Acoustic Doppler Velocimetry (DOP2000, Vectrino); high speed video image analysis; pressure gauges, inductive and ultrasonic level meters, electromagnetic and turbine flowmeters, etc. Luca loves boardgames, mountain bike, and particularly his daughter Irene Maria, his son Tommaso and his wife Elena.