

Physics of granular suspensions with applications to geophysical flows

Genoa, 1-5 July 2024

Course description

The course is conceived to provide PhD students with fundamental knowledge on the mechanics of granular suspensions as well as on the mathematical and numerical techniques that can be adopted to investigate geophysical flows. To this end, three formidably complex problems (sediment transport, flow-like landslide inception and gravity currents) are considered. A brief excursus into the physics of Brownian suspensions completes the course. The students will find a thorough combination of elements of fluid and solid mechanics, rheology, geotechnics, geomorphology, civil, chemical and coastal engineering. First, the dynamics of granular suspension is introduced from the mathematical viewpoint, focusing on issues that characterise geophysical flows such as turbulence, the effects of inter-particle contacts and strong velocity gradients. Then, different models that were successfully used to investigate the mechanics of granular suspension in environmental flows are presented.

Lecturer

Marco Mazzuoli (marco.mazzuoli@unige.it)

Topics

- Two-phase flow models
- Turbulence-particle interactions
- Rheology of granular suspensions
- Flow driven suspensions (e.g. sediment transport)
- Gravity driven suspensions (e.g. turbidity currents and debris flows)

Modalities

The course consists of frontal lectures (22 hours). Then, students are invited to prepare the brief presentation of a problem either dealing with their own research activity or taken from the literature, which involves granular suspensions. A “**Workshop**” completes the course where the presentations are individually given by the students.

Registration Deadline: 1st May 2024
31st May 2024

Registration

Go to the [REGISTRATION PAGE](#)
or scan the following **QR code**



Suggested book

Mazzuoli & Lacaze, “*Physics of Granular Suspensions*” Springer, May 2024

Program

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Location

Department of Civil, Chemical and Environmental Engineering (DICCA), Via Montallegro 1, 16145 Genoa ([GMaps](#))

Further information

Email to marco.mazzuoli@unige.it

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Preliminary Program

	1 st July	2 nd July	3 rd July	4 th July	5 th July
09:00	Registration	Locally averaged equations of particulate flow dynamics	Turbulence modulation	Sediment transport in coastal environment	Gravity and turbidity currents
10:00	A useful classification of granular suspensions		Modelling turbulence in particle laden flows		
11:00	Rheology of granular suspensions: from single to two-phase particulate systems	Interface resolved vs point-particle models	Participant Workshop	Participant Workshop	Towards more complex suspensions
12:00					
13:00	Lunch break	Lunch break	Lunch break	Lunch break	
14:00	Dry granular flows: the role of particle contacts	Rheology of dense granular suspensions	From solid to fluid transition	Sediment transport in riverine environment	
15:00		Effect of turbulence on particle dispersion			