Syllabus

Descrizione corso

Titolo insegnamento	Elements of experimental research and advanced applications of fluid mechanics
Codice insegnamento	46049
Titolo aggiuntivo	
Settore Scientifico-Disciplinare	CEAR-01/B
Lingua	Inglese
Corso di Studio	Corso di Dottorato di ricerca in Sustainable Energy and Technologies (Energie e Tecnologie sostenibili)
Altri Corsi di Studio (mutuati)	
Docenti	prof. Michele Larcher, Michele.Larcher@unibz.it https://www.unibz.it/en/faculties/agricultural-environmental-food-sciences/academic-staff/person/33885
Assistente	
Semestre	Secondo semestre
Anno/i di corso	1
CFU	3
Ore didattica frontale	18
Ore di laboratorio	12
Ore di studio individuale	75
Ore di ricevimento previste	9
Sintesi contenuti	The students will have the opportunity to improve their knowledge on some specific topics that are generally not treated in depth in basic courses of fluid mechanics, such as turbulence and non-Newtonian fluids, with a special focus on energy engineering applications. A significant part of the course will be devoted to the explanation and utilization of advanced measuring methods used for fluid mechanics applications in laboratory. In this way the

	candidates will acquire the competences necessary in order to design and carry out experimental measures on fluids within their research activity.
Argomenti dell'insegnamento	The course will cover the following topics: • Basics of experimental research • Turbulence insights • General features of complex fluids and granular flows • Advanced measuring techniques in fluid mechanics - Experimental methods, e.g. Particle Image Velocimetry (PIV), Particle Tracking Velocimetry (PTV), Laser Doppler Anemometry (LDA). - Experimental instruments - Experimental applications
Parole chiave	experimental research, fluid mechanics, experimental methods, Particle Image Velocimetry (PIV), Particle Tracking Velocimetry (PTV), Laser Doppler Anemometry (LDA).
Prerequisiti	
Insegnamenti propedeutici	
Modalità di insegnamento	Lectures, exercises and laboratory activities
Obbligo di frequenza	Not compulsory
Obiettivi formativi specifici e risultati di apprendimento attesi	By the end of the course, students are supposed to be able to: - Knowledge and understanding: explain the main principles relevant to the topics addressed in the course; develop an intuitive comprehension. - Applying knowledge and understanding: give examples of real applications and practical problems to underline how the topics treated in the course are used within scientific and engineering activity. - Making judgements: show the ability to make autonomous judgements in the choice and comparison of the suitable methods and tools for the solution of scientific and engineering problems involving the mechanics of fluids. - Communication skills: communication skills to correctly and properly present the concepts acquired in the course and the analysis of experimental results. - Learning skills: Ability to autonomously extend the knowledge acquired during the study course by reading and understanding scientific and technical documentation.

Obiettivi formativi specifici e risultati di apprendimento attesi (ulteriori info.)	
Modalità di esame	The assessment is based on a discussion on the topics covered within the course and on the presentation of the analysis of the results of the experimental activity.
Criteri di valutazione	Students will be evaluated on the base of the discussion of the experimental report. Evaluation is based on a 30 points scale. At the examination, knowledge and understanding of the topic (25%), the attitude at applying knowledge and understanding (20%) and at making judgments (20%), the communication skills (20%) and the learning skills (15%) will be assessed.
Bibliografia obbligatoria	The topics will be sampled out of different books and scientific publications. Attending regularly the classes and laboratory sessions is highly recommended. Some material will be made available during the lectures through Microsoft Teams
Bibliografia facoltativa	C. Bailly & G. Comte-Bellot, Turbulence, Springer, 2015 H. Tennekes & J.L. Lumley, A First Course in Turbulence. MIT Press, Cambridge 1972. J.O. Hinze, Turbulence, McGraw-Hill International Book Company, New York, 1975. Y.A. C¸engel, & J.M. Cimbala, Fluid Mechanics –Fundamentals and Applications, 2006, McGraw-Hill. R. Adrian, J. Westerweel, Particle image velocimetry, Cambridge University Press 2011. M. Raffel et al., Particle image velocimetry : a practical guide, Second edition, Springer 2007. Zhang, Zhengji. LDA Application Methods : Laser Doppler Anemometry for Fluid Dynamics. Berlin: Springer, 2010. Albrecht, H. -E., Damaschke, N., Borys, M., and Tropea, Cameron. Laser Doppler and Phase Doppler Measurement Techniques. Guildford : Berlin, 2010.
Altre informazioni	
Obiettivi di Sviluppo Sostenibile (SDGs)	Istruzione di qualità, Utilizzo responsabile delle risorse, Energia rinnovabile e accessibile