Avviso di Seminario

martedì 8 ottobre 2024, ore 12:00

il prof. **Giovanni Cascante**
(University of Waterloo, Ontario, Canada)

terrà un seminario dal titolo

Non-destructive Evaluation for Reliable Assessment of Civil Infrastructures and Soil Dynamics

Aula Croce
edificio C8, piano terra, via Claudio 21 – Napoli

Segreteria Direzione
Via Claudio 21
80125 Napoli
tel: +39 081 7683609
dicea@unina.it

Ufficio per la Didattica
Via Claudio 21
80125 Napoli
tel: +39 081 7683335
antonella.greco@unina.it

Ufficio Contabilità e Bilancio
Via Claudio 21
80125 Napoli
tel: +39 081 7683446
nicolina.naccarato@unina.it

Ufficio per la Ricerca
Via Claudio 21
80125 Napoli
tel: +39 081 7683939
rita.gallo@unina.it

Ufficio Contratti, Logistica e Personale
Via Claudio 21
80125 Napoli
tel: +39 081 7682320
gennaro.doria@unina.it

Non-destructive Evaluation for Reliable Assessment of Civil Infrastructures and Soil Dynamics

Abstract: The deteriorating condition of civil infrastructure worldwide, due to factors like aging, earthquakes, and climate change necessitates urgent attention. In the last four years, more than forty structures have collapsed worldwide, while, in the last ten years, 80 structures collapsed. Thus, there is a need for reliable condition assessment techniques. Currently, nondestructive evaluation (NDE) methods such as ultrasonic techniques are widely employed. However, their reliability for civil infrastructure has been a critical concern. The determination of damage extent often relies on visual inspection and changes in ultrasonic wave velocity. If more reliable NDE techniques were available, they could yield substantial cost savings compared to traditional invasive tests. Our research program aims to improve the reliability of NDE techniques and soil dynamic characterization (SDC) methods by using a) new technologies, b) robust experimental and numerical programmes, and c) statistical signal processing techniques including AI. Our work focuses on first understanding the complex wave-material interaction to ultimately improve NDE and SDC methods. The complexity of wave propagation arises from various factors, including material heterogeneity, geometry and boundary conditions, the interaction of multiple wave modes, dissipative effects, noise, and interference, among others. This work uses a combination of innovative technologies and numerical models. Complementary technologies such as ultrasonics, ultrasonic photoelastic imager, and a high-frequency laser vibrometer equipped with fibre optics are used to improve the reliability of NDE of civil infrastructure. Using ultrasonic methods, we measure changes in wave velocity and attenuation for damage detection, while the laser-vibrometer is used to correlate experimental measurements with different levels of damage using numerical models. This presentation covers the basics of wave propagation methods, the importance of transducer characterization, and the use of numerical simulations to explain wave-material interaction. Typical experimental results from nondestructive tests on concrete plates, asphalt pavements, wood poles and an earth embankment will be discussed. Experimental results show the importance of proper ultrasonic equipment characterization to avoid significant errors in wave-velocity and attenuations measurements. Experimental and numerical results show that ultrasonic waves can be successfully used to determine the internal condition of civil infrastructure.

Dr. Giovanni Cascante, P. Eng.
Professor
Department of Civil and Environmental Engineering
University of Waterloo
Waterloo, Ontario, N2L 3G1, Canada
T: +519 888-4567 ext.32098
gcascant@uwaterloo.ca

Around the world, cities are facing a major challenge: What to do about aging infrastructure such as bridges, water mains, roads, and electrical transmission lines. How can engineers know if they have years of life left in them or are on the verge of collapse? His research team is working towards innovating techniques to help distinguish the good from the bad -- without manually taking the system apart. Before joining the University, he worked for more than ten years in the consulting industry. His areas of expertise are in nondestructive testing of civil infrastructure, dynamic soil characterization (resonant column, BE, and ultrasonics), signal processing, numerical simulations of wave propagation, and vibration measurements. Dr. Cascante has authored more than 80 refereed journals publications and 75 conference papers, including award-winning papers (ASTM 2005, SAGEEP 2005, TAC 2006, CGS Honourable Mention for the 2023 R.M. Quigley Award). Dr. Cascante served as an associate editor for the Geotechnical Testing Journal (ASTM) and the Journal of Environmental and Engineering Geophysics.