



# Special Lecture on Prognosis and Diagnosis of Composite Materials and Structures: Potentialities for Offshore Applications

by Prof. Volnei Tita, University of Sao Paulo, Brazil

Monday 23rd March 2020, 14h30-18h00 (Room 2.0)

School of Engineering, Via Tombesi dall'Ova 55, Ravenna

**SHORT BIO:** Prof. Volnei Tita graduated in Mechanical Engineering in 1996 from University of São Paulo (USP - Brazil), he got his Master in 1999 and PhD in 2003 from USP with a part developed at KU Leuven (Belgium). He worked at EMBRAER in 2005-2006. He was visiting researcher at KU Leuven (Belgium - 2012). Tita is Associate Professor in the Aeronautic Engineering Department at USP since 2011 and published almost 300 papers in scientific journals and conference proceedings (>1100 citations and H=17). He received the Medal of Honor from Air Force Office of Scientific Research (USA). Tita is reviewer for 28 journals and editorial board member of 4 International Scientific Journals. He was secretary of the Aerospace Scientific Committee of Mechanical Science Brazilian Association in 2011-2013. Tita is member of Int. Council of the Aeronautical Sciences (ICAS). He was visiting professor at Faculty of Engineering of University of Porto (Portugal - 2017). He is the secretary of the Solid Mechanics Scientific Committee of Mechanical Science Brazilian Association in 2019-2021.

**ABSTRACT:** Although several models and failure criterion already exist for the simulation of damage in composite materials, most models do not produce acceptable results for detailed designs. The models currently in use often under or overestimate loads required for the degradation and failure. This occurs as most of these models are based upon phenomenological or semi-empirical data, which adjust failure surfaces or failure envelopes to experiments. Those approaches neglect the inherent anisotropy and heterogeneity of composite materials, which cause several failure mechanisms to occur simultaneously in different materials scales and phases. One possible solution to this problem is to use and/or develop new damage and failure models based on multiscale approaches and physical failure mechanisms based on Continuum Fracture Mechanics. For the development of these models, a proposed approach consists on using homogenization techniques to obtain degenerated elastic properties from damaged Representative Volume Elements (RVEs); the damage profile of the RVE is defined as intralaminar cracks parallel to the fiber directions and is calculated using multiscale analysis. The development of SHM (Structural Health Monitoring) system, which combines different methods, is a strategic alternative to overcome those challenges.

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## Program

### 14h30 - Welcome

ATENA Ravenna Emilia-Romagna

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AICO Association

### 15h00 - Volnei Tita - University of San Paulo, Brazil

### 17h00 - Q&A Session

The attendance of the entire duration of the seminar will credit no. 2 CFP to the engineers pre-registered on [www.isiformazione.it](http://www.isiformazione.it)

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