CIVIL AND ENVIRONMENTAL ENGINEERING

Ateneo - Gridshell structures: new methods for design and performance assessment with applications

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Context of the research activity	The design of gridshell structures shall simultaneously take into account different goals and meet final performances, by referring to multiple disciplinary competences such as the ones of architects, engineers, builders, and experts in mathematics and computer graphics. The aim of this research project is the development of new methodologies for gridshell design able to account for multiple performances, e.g., mechanical, buildability and sustainability performances, among others.
Objectives	Gridshells are lightweight form-resistant structures given by the discretization of a continuous curved surface into a grid of line-like structural members. Gridshell design can be quite an intricate process due to the significant number of variables affecting the performances of the built structure, thus requiring a multidisciplinary approach. On the basis of these premises, the research activity has the following objectives: 1-Define the critical state-of-the-art of the methods currently adopted for gridshell design and performance assessment; 2-Develop methodologies and tools specifically addressed to the conceptual design of gridshells, allowing to compare different design solutions keeping into account different performance metrics; 3-Develop multi-objective optimization tools for gridshell performance assessment taking into account mechanical, buildability and sustainability features; 4-Apply such novel methodologies in the framework of the FreeGrid “a benchmark on design and optimization of free-edge gridshells” to test and compare different approaches to the conceptual design of form-resistant structures. The research activity will be developed with the co-supervision of the engineering company Sintecna, whose decennial expertise in the design of steel structures and long span roofs among others will, on one hand, support the identification of the needs of the non academic sector and, on the other

	hand, evaluate the applicability of the proposed methodologies in the design practice.

Skills and competencies for the development of the activity	Skills in structural and architectural design of long-span roofs. Skills in 3D geometrical modelling. Skills in nonlinear analysis of structures.