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The polar formalism in analysis and optimal design of anisotropic structures

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The polar formalism was introduced by G. Verchery as early as 1979 as a method for finding the invariants of a planar tensor of any rank. With this method, a tensor is represented by invariants and angles; as such, this approach is particularly suited for representing anisotropic problems because it allow to introduce explicitly, on one hand, the intrinsic properties of the material with regard to a given physical phenomenon, through the invariants, and, on the other hand, geometrical parameters determining the direction: angles.
The polar formalism is particularly useful and effective in two circumstances: the study of some theoretical problems, namely linked to the symmetries, that are introduced in a natural and direct, algebraic way, and the design problems concerning anisotropic structures.
In the talk, we show first the basic elements of the polar formalism, then we focus on some theoretical considerations and problems solved thanks to the polar formalism and finally we show some modern design problems of anisotropic structures formulated as optimization problems in the design space of the polar parameters.

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Professore ordinario di Meccanica (Professeur des Universités de classe exceptionnelle) nella Università di Versailles e membro del Laboratoire de Mathématiques de Versailles. Ha conseguito nel 1996 il dottorato nell'Università di Firenze (DICEA). I suoi interessi di ricerca riguardano la Meccanica Teorica, con particolare riferimento all'Elasticità, alla Fluidodinamica e alla Meccanica delle Strutture, e l'Ottimizzazione, specialmente gli aspetti che concernono la progettazione dei compositi.