

STS04: OPTIMIZATION

VKI Lecture Series reporting on «Introduction to Optimization Methods and Tools for Multi-disciplinary Design in Aeronautics and Turbomachinery »

JACQUES PERIAUX^{1 2} AND TOM VERSTRAETE³

¹CIMNE, Spain, ²University of Jyvaskyla, Finland

³VKI Karman Institute, Belgium

OBJECTIVES

Innovative optimization and design techniques for modern aircraft (manned or UAV/UCAV) and engine systems aiming at maximum performance in a multidisciplinary context (aerodynamic efficiency, safety, drag, losses, weight, strength, heat fluxes, emission, noise,...), are rapidly moving from research labs to industrial real and virtual platforms. To reach this level of Excellence, emergent optimization methodologies require more and more robust and efficient associated software for a daily use in industrial collaborative design environments.

This course intended to provide basic concepts and tools behind this technology, both in single discipline (single point or multi point design) and multidisciplinary (fluid-structure interaction, fluid-acoustics, conjugate heat transfer, ...) context. Subjects treated in detail include: gradient based and steepest descent methods, adjoint methods, one shot or goal oriented methods, evolutionary/differential evolution algorithms on parallel environments, game strategies like Pareto Fronts and Nash Equilibrium, parameterization, surrogate and reduced-order modeling (Radial Basis functions, Artificial Neural Networks, Kriging ...), multi fidelity modeling approaches, robust design.

The main content of these VKI Lecture Series will be presented by academic and industrial expert lecturers in the field of Optimization and Design and is oriented towards junior and experienced engineers and researchers involved in the field of multi disciplinary design and looking for innovative numerical solutions to complex multi criteria optimization problems in Aeronautics and Turbomachinery.