

Design Optimization

Uni. Trieste, Trieste, Italy, 5-7 June 2017

Course Coordinator: Prof. K. Giannakoglou, National Technical University of Athens, , Greece

Rationale

Several years ago, and in recognition of the growing importance of “Design Optimization” to industrial CFD/CSM applications, ERCOFTAC has established a Special Interest Group, called SIG34. SIG34 now offers a course on “Design Optimization” providing an information platform to supporting and fostering a comprehensive exchange between science and industry. Nowadays, computational optimization is both an emerging and widely-used technology in a variety of industrial sectors. Motivated by the maturity of the design-optimization methods and software as well as the advent of powerful modern computational platforms, new automated design optimization methods have already been applied to numerous problems, e.g. in Computational Structural Mechanics (CSM), Computational Fluid Dynamics (CFD), Electro-magnetics, Propulsion, Energy Management and many others. Moreover, combinations of these areas as so-called multi-disciplinary approaches (e.g. fluid-structure interaction, fluid-electro-magnetics interaction) are in use for achieving improvements in “real-world” industrial designs.

Since “traditional” optimization methods often require a significant number of solution points in the design space in order to reach an improved (or optimal) design, substantial effort has been devoted to device efficient search strategies. Moreover, they have already been adapted to multi-objective and multi-disciplinary problems in order to cope with real-world engineering applications.

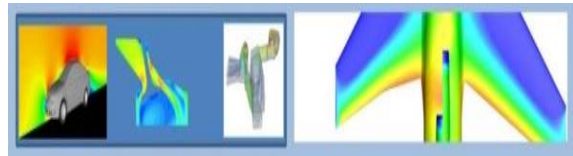
Aims

The course will provide:

- An overview of modern design optimization methods
- Comprehensive discussions on the presented methods including their pros and cons, assisting industrial engineers to select the best-suited approach for solving their particular problems.
- Based on the latter topic, successfully treated examples in the areas of aeronautics, the automotive, and the turbo-machinery industry will be presented and thoroughly

Hands-on session

Thanks to the fact that the event is organized with the local support of ESTECO Spa an hands-on-tutorial session will be delivered free of charge using modeFRONTIER on the day following the theoretical course. Due to limitation in space a maximum of 20 participants can be accepted for the Tutorial. Participants should have their own laptop where the software can be installed after registration on the ESTECO Academy web site: <https://academy.esteco.com/academy/ercoftac-design-optimization> Please make sure that both modeFRONTIER and Office Excel are installed prior to the training day. Should you need any support with installation please contact academy@esteco.com.

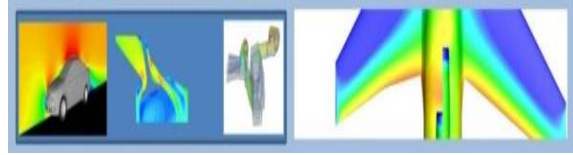


MONDAY JUNE 5, 2017

9:30	Welcome – Introduction to the course	Prof. K.Giannakoglou & Prof. Carlo Poloni
9:50	Introduction to gradient-free methods	Prof. T.Verstraete
10:50	Coffee Break	
11:20	Multi-objective EAs accelerated by metamodels - Applications	Prof. T.Verstraete
12:10	Asynchronous, Hierarchical, Distributed Metamodel-Assisted EAs - Applications	Prof. K.Giannakoglou
13:00	Lunch	
14:00	Introduction to Gradient-based Optimization	Dr. S. Schmidt
14:50	Discrete Adjoint	Dr. S. Schmidt
15:40	Coffee Break	
16:10	Continuous Adjoint	Prof. K.Giannakoglou
19:30	Dinner in the centre of Trieste	

TUESDAY JUNE 6, 2017

9:00	Discrete Adjoint & Industrial Applications	Dr. S. Schmidt
9:45	Continuous Adjoint & Industrial Applications	Prof. K.Giannakoglou
10:30	Coffee Break	
11:00	Robust and reliability based optimization applied to aerodynamic shape design	Prof. C.Poloni
12:00	Multidisciplinary Design Optimization from an Enterprise perspective	Dr. D.Quagliarella
12:30	Lunch	
13:30	State of the art and future trends in turbomachinery optimization	Dr. M.Meyer
14:30	Design Optimization in heat and mass transfer applications	Prof. E.Nobile
15:30	Coffee Break	
16:00	Multiobjective optimization of the Francis turbine runner cone	Dr. Roberto Renato Stopar
16:30	Optimization of double-sided centrifugal pump	Aljaž Škerlavaj
17:00	Discussion – Round Table - Closure	Prof. K.Giannakoglou



WEDNESDAY JUNE 7, 2017
Hands on session using ESTECO-modeFRONTIER
(for maximum 20 attendees, pre-registered)

Module1: modeFRONTIER: how to get started

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| 8:30 | Introduction to modeFRONTIER workflow and process integration | Tbd |
| 9:30 | Workflow creation - hands on | Tbd |

10:30 Coffee Break

Module 2: Focus on Surrogate Modeling and Advanced Optimization

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| 11:00 | Overview of possible optimization strategies: best practices for DOE and optimization algorithm choice | Tbd |
| 12:00 | Overview on different optimization methods: Piloport and Automatic schedulers, Multi-strategy algorithms: FAST, HYBRID, Game Theory (MOGT and nested optimization) | Tbd |

12:30 Lunch

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| 13:30 | RSM algorithms and best practice to train, evaluate and improve RSMs (ASF) | Tbd |
| 14:00 | Hands-on exercise | Tbd |

15:00 Coffee Break

Module 3: Advanced Statistical Analysis and Visualization tools

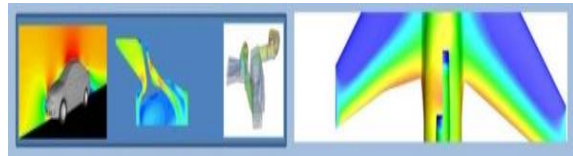
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| 15:30 | Theory and practice of common Statistical and Visualization tools
New Screening analysis tool – SS-ANOVA
Hands on and best practices for statistical analysis and post processing | Tbd |
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Module 4: Advanced methods for Robust Design Optimization

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| 17:00 | Industrial requirements and optimization under uncertainties scenarios | Tbd |
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Robust Design Optimization and Reliability-based Optimization: hands on exercises

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| 18:00 | Discussion – Round Table - Closure | Prof. C.Poloni |
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SPEAKERS:

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Fees:

Student Members €460, Members €595

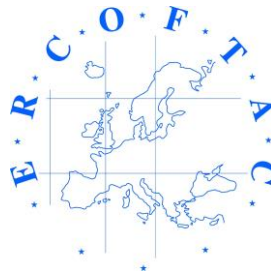
Italy Student Members €360

Student non-Members €530, Non-Members €895

Italy Student non-Members €460

Please note, fees do NOT include accommodation

Registration: richard.seoud-ieo@ercoftac.org



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