

## **Pre-simposio Modelado Computacional Virtual mode**

Realizado por: Dr. Emilio Carlos Nelli Silva

### **Title: Topology Optimization Method Applied to Multiphysics Design**

Introduction:

Topology optimization is a computational tool very useful in the conceptual phase of the Engineering design and it is expected to be used daily in engineering activities. Intuitive engineering design becomes a harder task with the increase of the complexity of the engineering systems. In this way, the application of topology optimization techniques represents gains in performance and in optimized designs. This course aims to integrate the knowledge of numerical optimization with computational analysis of mechanical systems.

The objective of this course is to provide the students the capabilities of using topology optimization methods applied to Engineering design. It is a design method that combines the finite element method with optimization algorithms to obtain the optimized design. Although structural design problems will be used as examples, the method can be extended to Multiphysics applications.

Contents:

1. Introduction to numerical optimization; a. design variables; b. objective function and constraints; c. optimization problem formulation; d. optimality conditions; e. sensitivity analysis.
2. Topology optimization methods; a. material models; b. SIMP method; c. TOBS method; d. BESO method

Previous knowledge: Finite element methods, optimization, linear algebra, differential equations.

Completion date: 17, 18 and 19 of August

Hours: 8 - 10 in the morning Colombia time, Work online  
two additional hours must be available for independent work