



# SEMINAR

APPLIED MATHEMATICS AND MECHANICS

FS1027

25 March 2026

A DCAMM seminar No. 801 will be presented by

**Assistant Professor Renato Picelli**  
**Polytechnic School of the University of São Paulo,**  
**Department of Naval Architecture and Ocean Engineering, Brazil**

The title of the lecture is

**Topology optimization of fluids and structures based on  
sequential integer linear programming and smooth boundaries**

**Abstract:**

Design optimization of fluids and structures, particularly involving various types of fluid-structure interactions (FSI), is an extremely challenging and interesting engineering problem. The optimal layout definition becomes arduous because the interaction between the fluid and the solid walls and domains depends on the geometry defined by each optimization step. This is even harder when considering the fluid flow can significantly deform the structure, which on the other hand changes the fluid flow path. This represents challenges not only for the optimization method but for the physical simulation employed. This work first reviews and discusses the available methods of topology optimization applied to fluid flow and FSI systems design. Topology optimization is the most flexible type of design optimization, in which new holes and structural members (consequently new fluid-structure interfaces) can appear during optimization. Then, a new topology optimization framework that includes geometry trimming and smoothing is discussed, namely TOBS-GT (Topology Optimization of Binary Structures with Geometry Trimming). Restricting the design to a set of binary  $\{0,1\}$  design variables, the method generates a representative smooth CAD geometry that can be freely meshed according to physics requirements, in this case, FSI. The optimization problem is solved by using sequentially integer linear programming and a new set of design variables is obtained. Numerical examples are shown to illustrate the capabilities of the method, including turbulent fluid flow, rotating machines, and fluid-induced vibration..

DATE: **Wednesday, 8 April 2026**

TIME: **11:00 – 11:45**

PLACE: **Benz Seminar room, (Ø31-605-2),  
Moseskovvej 72, 5230 Odense M  
SDU, University of Southern Denmark**

REGISTRATION for virtual participation at the following link: :

<https://syddanskuni.zoom.us/meeting/register/Q8PJt7d9ReKr349yKfeeCQ>

Cake, coffee and tea will be served 15 minutes before the seminar starts.

All interested persons are invited.

Joe Alexandersen/Jan Becker Høgsberg

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