



SEMINAR

APPLIED MATHEMATICS AND MECHANICS

FS1024

7 January 2026

A DCAMM seminar No. 799 will be presented by

Assistant Professor Lise Noël

**Computational Design & Mechanics Group, Department of Precision and Microsystems
Engineering, Faculty of Mechanical Engineering, Delft University of Technology, The Netherlands**

The title of the lecture is

Immersed Level Set-based Topology Optimization for Flow Problems

Abstract:

Engineering applications often rely on moving fluid to achieve specific functions. The performance of such flow devices can be controlled by optimizing their geometry. Originally introduced for structural design, topology optimization has been successfully extended to flow problems. Commonly used approaches rely on a porosity variable to generate optimized distributions of fluid and solid regions within a design domain and introduce resistive forces on the fluid through a Brinkman penalty.

However, such techniques might suffer from a poor representation of the fluid/solid interface and spurious diffusion of the pressure through the solid, especially if penalty parameters are not carefully selected. To design flow devices, accurately resolving the geometry of and the physics around fluid/solid interfaces is crucial. With these challenges in mind, this talk will explore the use of an alternative approach, an immersed boundary technique, to represent and predict the physics responses in flow problems. Design domains are immersed in a background mesh and the geometry of fluid/solid interfaces is defined implicitly by level set functions. Approximations are extended by a generalized Heaviside enrichment strategy and higher-order basis functions can be used for the design and state variable fields. The ability of immersed methods to accurately resolve flows is demonstrated with benchmark examples considering different geometry configurations, flow regimes, and coupled physics. The proposed immersed level set optimization framework is illustrated with the design of fluid devices for minimum pressure loss, minimum dissipated energy, target flow distribution, or maximum heat transfer.

DATE:	Wednesday, 21 January 2026
TIME:	11:00 – 11:45
PLACE:	Ellehammer Seminar room, (Ø28-600-3), Moseskovvej 72, 5230 Odense M SDU, University of Southern Denmark
REGISTRATION for virtual participation at the following link: : https://syddanskuni.zoom.us/meeting/register/zTXr3g5SSjm95Z2NtFXqnQ	

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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