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The Czech Society for Mechanics
and the Institute of Theoretical and Applied Mechanics, CAS,

cordially invite you to a lecture and discussion as part of the “**ITAM Seminar**” lecture series

Simulation Software for Developing CFRP Tank - Optimum Desing and Manufacturing

by

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The high-pressure hydrogen tank, made of carbon fiber-reinforced plastic (CFRP) with a plastic liner, that is, Type 4 tank, is key component of the fuel cell vehicles, contributing to the acceleration of carbon neutrality. The focus has been on reducing costs through the optimal design of lightweight structures, in addition to ensuring the long-term reliability of the CFRP tank through performance tests. Precise prediction of the burst pressure of the tank, primarily governed by carbon fiber strain, is indispensable for the reliable optimum design, especially for the dome part that is a complex structure formed by combining a metal boss, plastic liner, and CFRP layers. The variety of design parameters in this part is extensive, including shape, dimensions, fiber orientation, CFRP layer thickness, and more. Consequently, the complexity of the optimum design problem is such that conventional mathematical methods do not provide a solution. We have developed a system that uses the machine learning method to address the optimum design problem. After setting the design, optimization of the winding process and curing process becomes necessary. We have developed software to assess the increase in local stress during winding and residual stress after the curing process. All simulations are interconnected to efficiently support the development of the Type 4 tank. A demonstration of the software will be presented in the lecture.

**The lecture is scheduled for Monday, February 26, 2024, at 14:00,
in the small lecture room at ITAM, Prague.**

Upon request, we can also provide a Zoom stream for remote participation.