Leveraging structural optimization for more efficient, sustainable and economical structures

This seminar will delve into the potential of structural optimization to create more sustainable and economical structures. The presentation will open with an introduction to the principles of structural optimization. It will then examine three specific case studies in slab design optimization, demonstrating how optimization enhances structural efficiency as well as illustrating some general aspects of structural optimization. The discussion will commence with the layout optimization of plate supports, illustrating the complexities due to the non-convexity and non-linearity characterizing typical structural optimization problems. Following this, the seminar will explore the optimization of slab thickness, weighing the implications of manufacturability against structural efficiency. In the final example, I will present layout optimization of post-tensioning cables in slabs and show how optimization not only refines design but also deepens our understanding of structural systems. In summary, this seminar will emphasize the potential of structural optimization as a design tool that leads to significant material savings. Moreover, the presented examples will challenge our structural intuition and show that often minor changes in traditional approaches are sufficient to gain significant material savings.

Biography:

Dr. Yakov Zelickman is a postdoctoral fellow at The Johns Hopkins University's Department of Civil and Systems Engineering. He earned his PhD in Structural Engineering from the Technion - Israel Institute of Technology, where his research focused on theoretical aspects of structural optimization as well as its application to design of concrete slabs in buildings. Yakov Zelickman is a licensed structural engineer, and has an extensive design experience as a structural designer and consultant. Currently, at Johns Hopkins, his research focuses on advancing optimization methods for civil, aerial, and micro- structures. His research resulted in numerous publications in prestigious journals, active participation in international conferences, and wide collaborations with academia and industry partners. Dr. Zelickman has been honored with several awards for his academic contributions, including the Nezer Prize for outstanding research in the analysis and design of structures. He is also an active member of the Optimal Structural Design Committee of the Structural Engineering Institute, ASCE, underscoring his dedication to furthering the field's development.