

Gears research group

Our research group focuses on advanced mechanical engineering, gear technology, and manufacturing precision through a comprehensive portfolio of theoretical, virtual, and experimental projects. A major pillar of our activity involves the virtual simulation and accuracy analysis of gear systems, alongside the numerical modeling and experimental study of tooth surface load distributions. We also specialize in advanced manufacturing simulation and surface optimization, focusing on improving 3D surface quality through virtual material removal and the optimization of successive 3D solid subtraction methods. Furthermore, we investigate innovative gear geometries—such as compensated cosine profile gears—by analyzing relative sliding, root stress distribution, and manufacturing errors. Our work also extends to the conceptual refinement, technological enhancement, and precision improvement of gear cutting tools, including gear shapers and hob cutters. Finally, keeping pace with modern manufacturing trends, our group explores gear production via additive manufacturing, conducting detailed dimensional analyses and wear property evaluations of 3D-printed gears to bridge the gap between rapid prototyping and high-performance industrial applications.

Members

- dr. Máté Márton
- dr. Hollanda Dénes
- dr. Tolvaly-Roşca Ferenc
- dr. Egyed-Faluvégi Erzsébet
- dr. Kántor József
- dr. Gergely Attila Levente
- drd. Hodgyai Norbert
- drd. Gál Károly István

Partner institutions

- Budapest University of Technology and Economics, Hungary
- John von Neumann University, Hungary
- Transilvania University of Braşov – Romania

Research Grants

- Klebelsberg Kuno scholarship.
- MTA Domus Scholarship

Recent publications

1. Máté, M., Tolvaly-Roşca, F., Hodgyai, N.; Drăgoi, M.V.: A new approach of defining the grinding wheel profile of the Gear Hob's Rake Face. in: 2022 IEEE 22nd

- International Symposium on Computational Intelligence and Informatics and 8th IEEE International Conference on Recent Achievements in Mechatronics, Automation, Computer Science and Robotics (CINTI-MACRo). 21-22 November 2022. Date Added to IEEE Xplore: 03 February 2023. DOI: 10.1109/CINTI-MACRo57952.2022.10029498. Publisher: IEEE
2. Hodgyai, N., Máté, M., Oancea, Gh., Dragoi, M.V. : Review: Gear Hobs—Cutting Tools and Manufacturing Technologies for Spur Gears: The State of the Art. *Materials* 2024, 17(13), 3219; DOI: 10.3390/ma17133219 , ISSN: 1996-1944. IF3.1
 3. Egyed-Faluvégi, Erzsébet, Attila Levente Gergely, and József Kántor. "Dimensional Precision of Plastic Gear Tooth Profiles Produced by 3D Printing." *Engineering Proceedings* 113, no. 1 (2025): 38.