HOCHSCHULE FURTWANGEN UNIVERSITY HFU

HFU Powertrain & Machine Validation Laboratory

Furtwangen University is a leading technical university, where **Prof. Jäger** is member of the Institute for Product and Service Engineering (IPSE) and heads the Powertrain and Machine Validation Laboratory. The **methodological Top-Down System Validation Framework** applied by the group around Prof. Jäger systematically integrates physical and virtual testing across different abstraction levels, from single components to full systems, tailored to the demands of modern, simulation-driven product development.

Research Field/Expertise

- Methods and processes for the development and validation of technical systems
- Virtual and physical product validation in mechanical and automotive engineering
- Topology optimisation of machine and vehicle components
- Real and virtual analysis of machine vibrations
- Intelligent machines and systems

Research Methods

Virtual methods:

- Dynamic analyses (FEA and MBS)
- Multi-domain system simulation (1D)
- Linear/non-linear structural-mechanical analyses (FEA)
- Acoustic simulation (coupled 1D & 3D)
- Topology optimisation

Physical validation environment:

- Powertrain & Gear test rig
- Utilisation of XiL and closed-loop methods
- Design of Experiments (DoE)
- Sensors and measurement microphones

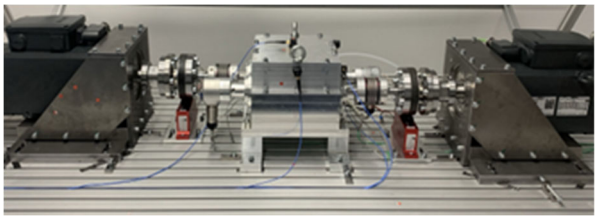
Lab Equipment

Powertrain Test Rig

- Testing of electric powertrain units for electric vehicles
- Real-time capability
- Highly modular overall design
- Powerful output machines (PN 250 kW) for the simulation of driving resistances
- Powerful battery emulation (PN 250 kW)

Gear Test Rig

- Optimising efficiency and noise emissions of gears
- High-speed el. motors (nmax 20.000 min-1, PN 5,5 kW, Pmax 23,5 kW)
- Real-time capability
- High-precision testing of gears for electromobility



Research Interests

We offer collaboration in the field of coupled experimental-simulation based system validation in sustainable mobility and energy systems.

Potential ideas are R&D on cognitive machines, digital twins, brake emissions, H_2 combustion, and modern product development.

HORIZON EUROPE calls of interest (amongst others): HORIZON-CL6-2025-01-ZEROPOLLUTION-01, HORIZON-CL5-2026-01-D2-01, HORIZON-CL5-2026-01-D2-05, HORIZON-CL5-2025-01-Two-Stage-D2-02, HORIZON-CL5-2025-02-D2-06, HORIZON-CL5-2025-04-D5-04.

Contact: Prof. Dr.-Ing. Steffen Jäger
steffen.jaeger@hs-furtwangen.de

Publications