

MechaTwing Summer School

Aeroelastic and Structural Challenges in Future Aircraft Design

Dear MechaTwing partners, dear Aerospace Community, dear Sir or Madam,

we kindly invite you to our first Summer School from June 2 to June 6 as part of the project MechaTwing, funded by the European Union. We will bring together scientists and experts for lectures, workshops, and technical discussions with a focus on the aeroelastic and structural challenges in future aircraft design.

Future transport aircraft are characterized by the urgent need to lower climate-damaging emissions. From the aircraft design point of view, new concepts, such as high aspect ratio wings, show great promise. They lower the induced drag significantly but implicate a number of aeroelastic challenges. The demanding aerodynamic design for transonic airspeeds and the high structural flexibility of high aspect ratio configurations require new methods for the multidisciplinary (aeroelastic) analyses and optimization. Nonlinearities are present in all the disciplines involved, and advanced control methods are required to ensure feasibility and safe operation (e.g. loads and flutter control). Also novel actuation technologies based on mechatronic systems which can drive control surfaces in limited space with high bandwidth are required. Various topics related to these challenges are treated in this summer school in terms of lectures and workshops, including experiments and the introduction of specific software:

Lectures to introduce both fundamental and advanced topics of

- ♦ Aeroelasticity, Loads, Aerodynamic Design of Aircraft, Flow Control (W.-R. KRÜGER, M. RITTER, A. SEITZ, J. SERPIERI)
- ♦ High-Fidelity Loads Analyses, Transonic Aerodynamic Design, Vortex Identification and Control, Parametric Aeroelastic Model Generation, Nonlinear Optimization of Highly Flexible Transport Aircraft Structures, Aeroservoelastic Modelling with High-Fidelity Unsteady Aerodynamics, Advanced Methods for System Theory and Control, Aeroelastic Analysis with Non-Linear Beam Finite Elements, Mechatronic Actuation and Structural Morphing, Structural Dynamics and System Identification (J. FELDWISCH, A. SEITZ, M. PATY, T. KLIMMEK, M. ZIMMER, D. QUERO-MARTIN, A. SCHIRRER, E. CESTINO/G. FRULLA, M. VALASEK, J. GUNDLACH)

Hands-on experiments in the laboratory to demonstrate

- ♦ Static and Dynamic Aeroelastic Effects in the Wind Tunnel (Divergence, Flutter, Limit-Cycle Oscillations) and the Impact of System Parameters (A. ALTKUCKATZ)
- ♦ Experimental Modal Analyses and Applied System Identification (J. GUNDLACH, M. RITTER)

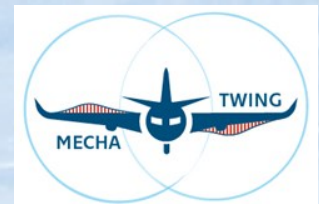
Workshops to introduce

- ♦ *LoadsKernel*, an Open-source state-of-the-art Loads and Flight Dynamics Toolbox (A. VOSS)
- ♦ *cpacs-MONA*, an in-house Aeroelastic Model Generator with Structural Optimization (T. KLIMMEK)

The Summer School will be given in English.

Registration—info on page 2

June 2-6 2025, DLR Institute of Aeroelasticity, Göttingen, Germany



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REGISTRATION—email to: casr@fs.cvut.cz

REGISTRATION:	On-site participation	Live-stream participation
Registration	Free-of-charge NOTE: lunch and social events are paid by the participants, small refreshments will be provided free-of-charge	Free-of-charge NOTE: Link will be send to the registered participants closer to the event
Registration cut-off date	By Sunday, 25/5/2025	

ACCOMMODATION:	Early-bird-booking (by 27/4/2025)	Booking after 27/4/2025
Eden Hotel Göttingen Reinhäuser Landstraße 22a D-37083 Göttingen Tel. 0551 50 72 00 Fax 0551 50 72 111 ed.letoh-nede@ofni https://www.eden-hotel.de/Eden-Hotel-Gottingen-0527304550.html	€ 99 per night/per person (single room), incl.breakfast Use the keyword <i>MechaTwing</i> to book rooms at the re- duced rate hotel for the MechaTwing Summer School	Charge per night/per person might be higher To book rooms please contact the hotel directly

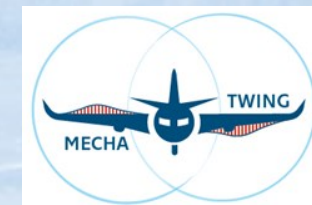
We are looking forward to welcoming you in Göttingen. The MechaTwing Summer School is coordinated by the MechaTwing Organizing Committee.

Enquiries—program & content: markus.ritter@dlr.de

Enquiries—admin & general: casr@fs.cvut.cz (Radka Preclikova)



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	Monday, June 2 Aeroelasticity and Loads	Tuesday, June 3 Aerodynamics and Flow Control	Wednesday, June 4 Structures and Control	Thursday, June 5 Structures and Mechatronics	Friday, June 6 Structural Dynamics
9.00-9.45	Welcome	Introduction to Loads Analyses	Parametric Model Generation	Introduction to Flow Control and Applications	Structural Dynamics and System Identification
9.45-10.30	Introduction to Aeroelasticity	High-Fidelity Loads Analyses	Introduction to <i>cpacs-MONA</i>	Introduction to Flow Control and Applications	Structural Dynamics and System Identification
10.45-11.30	Introduction to Aeroelasticity	Introduction to <i>LoadsKernel</i>	Optimization of Highly Flexible Structures	Nonlinear Aeroelastic Analyses	System Identification (Laboratory)
11.30-12.15	Introduction to Aeroelasticity	Introduction to <i>LoadsKernel</i>	Aeroservoelasticity with High-Fidelity Unsteady Aerodynamics	Nonlinear Aeroelastic Analyses	System Identification (Laboratory)
13.30-14.15	Wind Tunnel Testing (Laboratory)	Introduction to Aerodynamic Design	Advanced Control Technologies	Mechatronic Actuation and Structural Morphing	Wrap-up and final discussion
14.15-15.00	Wind Tunnel Testing (Laboratory)	Aerodynamic Design of Transport Aircraft	Advanced Control Technologies	Mechatronic Actuation and Structural Morphing	Wrap-up and final discussion
15.15-16.00	Introduction to Loads Analyses	Vortex Identification and Control	Advanced Control Technologies	Discussion/Networking	
16.00-16.45	Introduction to Loads Analyses	Vortex Identification and Control	Advanced Control Technologies	Discussion/Networking	
Evening	Social Event	Social Event	Social Event	Social Event	