

Invited Seminary

Simulation and analysis of energy systems

**Module 1: Solar thermochemical water splitting for green hydrogen generation –
From modeling a prototype to experimental results**

**Module 2: Energy efficiency in ship energy systems – Modelling with Simulations
and results for several case studies**

Prof. Dr. rer. nat. Jörg Lampe

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Tuesday, December 10th 2024, 10:00 -18:00

Biblioteca storica, University of Naples Federico II, P. le Tecchio, 80, 80125 – Naples

Students who pass the test after the seminar will receive 1 CFU (or 0.5 CFU for one single module)

Outline

In the first part of the seminary a new promising technology for green hydrogen generation is discussed, i.e., thermochemical water splitting. The background of the technology is given together with its fundamental working principle, and some historic overview. Then the basic process cycle is explained, and the investigated prototype is introduced. Various details and research results from the two research projects Astor and Astor_ST are given regarding modelling, simulation, visualizing, and optimization the 250 kW prototype reactor. Additionally, experimental results are presented together with various practical challenges for the reactor in a real-world usage in the field, i.e., on a solar tower. It is concluded with a techno-economical study of the considered prototype plant

In the second part the focus is on energy efficiency of ship energy systems. A brief introduction to the background of maritime environmental and efficiency regulations is given. Afterwards the software library ShipEnergySystems is introduced, which has been developed by Germanischer Lloyd and ESI/ITI as part of the software environment SimulationX. Some background on the history and development of the library is given, together with its main working principles, components, combined with a short introduction into modeling with SimX, to provide a feeling for the complexity and depth of possible models. Finally, several case studies are presented, with focus on efficient energy systems onboard ships, and results are discussed.



Rheinische
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Köln

Prof. Dr. rer. nat. Jörg Lampe

Professor of Systems Theory and Mathematics. Current research activities: modeling and simulations of complex dynamic systems, energy, efficiency and reliability analyses.

Biography

After completing his Systems Engineering studies in 2006 at the Hamburg-Harburg University of Technology, Jörg Lampe conducted research in numerical linear algebra at TuTech Innovation GmbH in 2009 and earned his doctorate on the topic of total least squares problems. His doctoral research was funded by a medical technology BMBF project, where novel and efficient algorithms for specific inverse problems were developed. He continued to deepen this work as a Post-Doc at TUHH until 2011.

Subsequently, he held various roles and positions in research and product development at Germanischer Lloyd SE and later at DNV GL SE until 2017. His main focus areas included modeling and simulation of energy-efficient maritime systems, development of calculation tools and software libraries, and coordination of maritime industry and research projects in the fields of systems engineering and simulation.

Since 2018, Prof. Dr. rer. nat. Jörg Lampe has been teaching as a professor of System Theory and Mathematics at the Cologne University of Applied Sciences.