

**Prof. Dr. Axel Klawonn**  
Numerische Mathematik und  
Wissenschaftliches Rechnen  
Mathematisches Institut  
**Universität zu Köln**

**Prof. Dr.-Ing. Carolin Birk**  
Fachgebiet Statik und Dynamik  
der Tragwerke (BauWi)  
**Prof. Dr.-Ing. Jörg Schröder**  
Institut für Mechanik (BauWi)  
**Universität Duisburg-Essen**

**Prof. Dr. Matti Schneider**  
Institut für Ingenieurmathematik  
**Universität Duisburg-Essen**

### Seminar Numerische Mathematik und Mechanik

#### **„Modeling of dynamic issues of high-speed railway subgrade“**

**Prof. Dr.-Ing. Yao Shan**  
Tongji University Shanghai-College of Transportation

#### **Abstract**

The operational safety of high-speed trains (operating at speeds approaching 400 km/h and even higher) is highly sensitive to track irregularities. Such irregularities occur far more frequently on subgrade sections than on bridge and tunnel sections. This presentation introduces subgrade dynamic modeling in three parts:

- 1) First, macroscopic models of the vehicle–track–subgrade coupling system in both the time and frequency domains are presented, along with the dynamic responses induced by stiffness irregularities.
- 2) Second, the mesoscopic mechanical evolution of subgrade soil under high-frequency dynamic loads and its corresponding modeling method are illustrated.
- 3) Third, the predictive modeling of subgrade deformation caused by adjacent construction activities is discussed.

**Ort: Universität Duisburg-Essen  
Universitätsstr. 15, 45141 Essen, V15 R04 H25**

**Zeit: 22.06.2026 ab 16:00 Uhr**

**gez. Prof. Dr. A. Klawonn**  
**gez. Prof. Dr.-Ing. C. Birk**

**gez. Prof. Dr.-Ing. J. Schröder**  
**gez. Prof. Dr. Matti Schneider**

Telefon: + 49 221 470 78 68, E-Mail: [klawonn@math.uni-koeln.de](mailto:klawonn@math.uni-koeln.de)

Telefon: + 49 201 183 26 82, E-Mail: [j.schroeder@uni-due.de](mailto:j.schroeder@uni-due.de)

Telefon: + 49 201 183 26 67, E-Mail: [carolin.birk@uni-due.de](mailto:carolin.birk@uni-due.de)

Telefon: + 49 201 183 65 01, E-Mail: [matti.schneider@uni-due.de](mailto:matti.schneider@uni-due.de)