

BIWE-10: Modelling and Simulation in Pavement Engineering

(Prof. Wellner, Dr. Werkmeister)

Contents

- 1) Pavement Types
 - Pavement Purpose
 - Pavement Types
 - Pavement Materials
 - Factors affecting Pavement Performance (Overview)
- 2) Material Characterisation (UGM HMA)
 - Introduction
 - Stresses and Strains
 - Stiffness
 - Strength
 - Permanent Deformation
 - Fatigue
 - Non-linearity
 - (An)isotropy
 - Pavement Loading
 - Basic Tests
 - Determination of Stiffness
 - Determination of Strength
 - Determination of Permanent Deformation Behavior
 - Determination of Fatigue Resistance
- 3) Block Pavement Modeling and Testing
 - Introduction
 - Performance of Block layer under loaded condition
 - 2 D structural model
 - 3 D structural model
 - Simulation of the performance - laboratory tests
- 4) Subgrade Evaluation
 - Introduction
 - Influence Factors
 - Testing Methods
 - Material Parameters
 - Modification/Stabilization
- 5) Basecourse Evaluation
 - Types
 - Construction Considerations
 - Resilient Deformation
 - Permanent Deformation
 - Testing
 - Moisture Content, Grain Shape, Grading, Density
- 6) Asphalt Pavements
 - Asphalt Pavement design procedure
 - RSTO
 - Mechanistic-analytical Design Procedure according to RDO Asphalt
 - Traffic

- Material Parameter
 - Climatic Conditions
- Stiffness of Asphalt
- Strength and Fatigue Resistance of Asphalt
- Design Process
- Examples
- 7) Modeling of Tire-Pavement Interaction
 - Truck Tire Types
 - Forces on the Tire
 - Axle load distribution
 - Stress Distribution in the Pavement due to a Tire Load
 - Contact Stress Measurements In-situ
- 8) Field Model Validation
 - HVS
 - Circular Test Track at LCPC
 - CAPTIF
 - Model Validation Procedure

Prerequisite Knowledge

- Mechanics, statics, theory of structures
- Basics in soil mechanics, behaviour of soils

Topics of Project and Master Thesis

- Modelling (numerical analysis) of pavement structures – simulations of pavement performance using a FE code
- Construction and design of pavements
- Experimental study on the performance of pavement materials (duration and analysis of laboratory tests)

Literature

German Literature

Straßenbautechnik (Velske, Mentlein, Eymann – Wernerverlag 1998)
 Straßenbau (Wiehler u.a. – Verlag für Bauwesen)

English Literature

Highways, The Location, Design, Edited by C. A. O’Flaherty, 2002, ISBN 0 7506 5090 7
 Design and Performance of Road Pavements, D. and P. Croney, ISBN 0 07 014451 6

Links for possible Topics of Master Thesis

- [Modelling and Simulation in Pavement Engineering](#)