

BIWO-01: Building Materials (Prof. Mechtcherine)

Contents

- 1) Microstructure and chemical composition of building materials
- 2) Physical properties, mechanical properties and durability of construction materials
 - Timber
 - Metallic materials
 - Concrete
 - Masonry
- 3) Fracture mechanics of structures made of steel and timber
 - Introduction into Linear-Elastic Fracture Mechanics (LEFM)
 - Introduction into Non-Linear Fracture Mechanics (NLFM)
 - Fracture mechanics of steel and steel structures
 - Fracture mechanics of timber and timber structures
- 4) Strength and deformation behaviour of concrete
 - Behaviour under tension and compression
 - Fracture mechanics
 - Size effect
 - Shrinkage
 - Creep
 - Stresses due to temperature changes
- 5) High-performance cement-based materials
 - Self-Compacting Concrete (SCC)
 - Fibre Reinforced Concrete (FRC)
 - Strain-hardening Cement-based Composites (SHCC)
 - Textile Reinforced Concrete (TRC)
 - Ultra-High Performance Concrete (UHPC)
- 6) Numerical simulation of concrete flow: Distinct Element Method

The lessons to the above topics are followed by exercises and demonstrations in the laboratory.

Prerequisite Knowledge

- Basic knowledge in construction materials and mechanics.

Topics of Project and Master Thesis

- Testing and numerical simulation of the rheological behaviour of fresh concrete
- Self-healing of cracks in modern fibre-reinforced concrete materials
- Strengthening of masonry using strain-hardening cement-based composites
- Durability of structures made of advanced concrete materials
- Material design for specific structural applications

Literature

- N. Jackson, R.K. Dhir: Civil Engineering Materials, MACMILLAN, 1997, ISBN: 0-333-63683-X
- J.F. Young, S. Mindess, R.J. Gray, A. Bentur: The Science and Technology of Civil EngineerinSg Materials, Prentice Hall, N