

Official RILEM EAC and TUDa Course  
**Computational Methods for  
 Building Physics and  
 Construction Materials**

**ON-LINE !!** : July 6 – 10, 2020

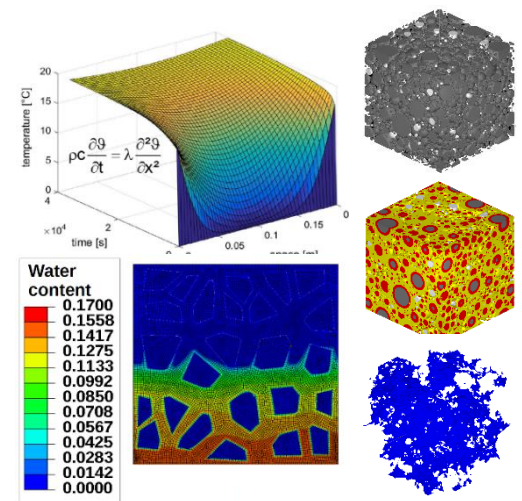


Teachers: Prof. Dr. ir. E.A.B Koenders, Dr. chem. Ing. N. Ukrainczyk, Dr. Antonio Caggiano, M.Sc. Ch. Mankel

The course will be offered online via **ZOOM** – Sign in to receive the link

**Course description:**

The course contains in-depth lecturing on different computational methods for differential equations, numerical solution strategies, explicit and implicit discretization, finite difference method, method of lines, boundary conditions implementation of physical processes that frequently occur in construction materials. Emphasis will be on the meso-scale level and on transport processes that are active in porous construction materials such as concrete, geopolymers, insulation materials, etc. Typical problems that will be addressed in this course will be on modelling moisture and/or reactive transport in porous media, heat transport and effect of insulation, coupled moisture - heat systems, and cement hydration kinetics. The course will provide a full solution strategy approach, so from a physical problem, to schematization and discretization, to boundary conditions evaluation, and to computational solution.



**Key topics:**

- **Steady state problems – discretization and implementation in Excel**
- **Transient problems – explicit & implicit heat and moisture flow – implementation in Octave/Matlab/FEM**
- **Coupled systems – heat and moisture flow, discretization and implementation in Octave/Matlab/FEM**
- **Particle structure formation and hydration kinetics of cementitious systems**

**Full online course program:**

CMBPCM	Time	Monday	Tuesday	Wednesday	Thursday	Friday
	8.45 - 9.00	Welcome, introduction and presenting RILEM				
Lectures	9.00 - 10.15	Introduction schematization and discretization	Transient discretization problem, explicit method in Excel	Transient discretization problems, boundary conditions evaluation	Transient multi-layer systems, implicit implementation in Octave/Matlab	Particle structure schematization and Kinetics and implementation
	10.15 - 10.45	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
	10.45 - 12.30	Steady state problem, explicit implementation in Excel	Transient discretization problem explicit method in Octave/Matlab	Transient discretization, implicit implementation in Octave/Matlab	Transient heat-moisture systems, implementation in Octave/Matlab	FEM - Discretisation and Implementation in Octave/Matlab
	12.30 - 13.30	Lunch	Lunch	Lunch	Lunch	Lunch
Demos	13.30 - 15.30	Demo on steady state Excel implementation	Demo on explicit transient implementations	Demo on implicit transient implementations Octave/Matlab	Demo on coupled heat - moisture systems Octave/WUFI	Demo on hydration and FEM implementations
	15.30 - 16.00	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
Exercises	16.00 - 17.30	Exercises 1	Exercises 2	Exercises 3	Exercises 4	Exercises 5

**Objective:**

Objective of the course is to train MSc, PhD and Postdoc students on how to solve common differential equations and what solution strategies can be applied to simulate physical problems in construction materials. After finishing this course, students will be able to use computational methods skills for their own research.

**Venue:**

The course will be offered via the online platform ZOOM.

**Costs:**

- PhDs and Postdocs: 250 Euros for the full 5 day course (Discount price)
- PhDs and Postdocs: signing in for one or more single days, 75 Euro per day
- MSc students from the TU Darmstadt: Free
- MSc students from other Universities: 75 Euros for the full 5 day course
- MSc students from other Universities: signing in for one or more single days, 25 Euro per day

This includes the course attendance, basic course materials like a PDF-copy of all PPTs, Octave and FEM codes used during lectures and provided for exercises, useful links to freeware, etc.

**Contact information:**

TU Darmstadt MSc students can register via the TU Darmstadt TUCaN system.

Other MSc, PhD or PostDoc students can register via the following contact information:

Institute of Construction and Building Materials

Ms. A. Cevik

E-Mail: [info@wib.tu-darmstadt.de](mailto:info@wib.tu-darmstadt.de)

Tel: +49-6151-16-22210

**Extra information:**

For the non TU Darmstadt students also doing the exam, a confirmation document with 6 ECTS will be provided by TU Darmstadt. This document can be used for the graduate school.

<b>Summary</b>	<b>Technische Universität Darmstadt</b>	The RILEM logo is a blue square containing a white stylized 'R' and the word 'rilem' in a blue, lowercase, sans-serif font.
<b>Course</b>	Institute of Construction and Building Materials	
<b>Information</b>	Campus Lichtwiese, TU Darmstadt	
	Address: Franziska-Braun-Straße 3, 64287 Darmstadt	
<b>CP / ECTS:</b>	6 / 6	
<b>Exam:</b>	An exam will be offered	
<b>Room:</b>	ZOOM – Virtual Room	
<b>Language:</b>	English	