



**Engineering Mechanics
Graduate course ' Multi-scale and Micromechanics'
November 2020**

Time frame:

Module 1: Monday November 9th – Wednesday November 11th

Module 2: Monday November 23rd – Wednesday November 25th

Local organizing committee (LOC)

Hans van Dommelen
Marc Geers
Johan Hoefnagels
Varvara Kouznetsova
Marc van Maris
Ron Peerlings

Secretary: Alice van Litsenburg

Lecturers team

Can Ayas	Delft University of Technology
Issam Doghri	Université Catholique de Louvain
Hans van Dommelen	Eindhoven University of Technology
Marc Geers	Eindhoven University of Technology
Johan Hoefnagels	Eindhoven University of Technology
Markus Hütter	Eindhoven University of Technology
Varvara Kouznetsova	Eindhoven University of Technology
Regina Lutge	Eindhoven University of Technology
Francesco Maresca	Groningen University
Thomas Pardoën	Université Catholique de Louvain
Ron Peerlings	Eindhoven University of Technology
Olaf van der Sluis	Eindhoven University of Technology

Daily time schedule

Lecture period I	: 09.00-10.00 (not on the first day of each module)
Short coffee break	: 10.00-10.15
Lecture period II	: 10.15-11.15
Short coffee break	: 11.15-11.30
Lecture period III	: 11.30-12.30
Lunch break	: 12.30-13.30
Lecture period IV	: 13.30-14.30
Training session	: 14.45-17.30

Module 1: November 9th – November 11th 2020

Multi-scale & crystal plasticity

- Homogenization: closed-form, computational and asymptotic schemes
- Coarse graining
- Micromechanics of crystalline materials.

Monday November 9 th	AM	11.00-12.00	Multi-scale and Micromechanics: Introduction, Overview, Mathematical background	Marc Geers
	PM	13.00-14.00	Homogenization concepts	Varvara Kouznetsova
		14.15-15.15	Thermodynamics perspective on coarse graining	Markus Hütter
		15.30-16.30	Thermodynamics perspective on coarse graining	Markus Hütter
Tuesday November 10 th	AM	09.00-10.00	Asymptotic homogenization	Ron Peerlings
		10.15-11.15	Crystal plasticity	Hans van Dommelen
		11.30-12.30	Discrete dislocation mechanics	Can Ayas
	PM	13.30-14.30	Discrete dislocation mechanics	Can Ayas
		14.45-17.30	Crystal plasticity: training session	Hans van Dommelen Tim van Nuland Mathieu Oude Vrielink
Wednesday November 11 th	AM	09.00-10.00	Computational homogenization: theoretical aspects	Varvara Kouznetsova
		10.15-11.15	Computational homogenization: numerical solution	Varvara Kouznetsova
		11.30-12.30	Mean-field homogenization of elastic/inelastic materials	Issam Doghri
	PM	13.30-14.30	Mean-field homogenization of elastic/inelastic materials	Issam Doghri
		14.45-17.30	Training session on computational homogenization	Varvara Kouznetsova Marc Geers

Module 2: November 23rd – November 25th 2020

Micromechanics

- Thin films – Interfaces
- Experimental micromechanics
- Ductile damage
- Molecular dynamics
- Microstructure evolution and phase field models
- Micro- and nanofabrication methods

Monday November 23 rd	AM	10.15-11.15	Microstructural evolution & phase field models	Marc Geers
		11.30-12.30	Microstructural evolution & phase field models	Marc Geers
	PM	13.30-17.30	MicroFab session	Regina Luttgé
Tuesday November 24 th	AM	09.00-10.00	Experimental micromechanics	Johan Hoefnagels
		10.15-11.15	Microscopy	Johan Hoefnagels
		11.30-12.30	Atomistic modelling: computational methods	Francesco Maresca
	PM	13.30-14.30	Atomistic modelling: application to dislocations	Francesco Maresca
		14.45-17.30	Multi-scale lab: observing and testing across length scales	Johan Hoefnagels Marc van Maris Ron Peerlings
Wednesday November 25 th	AM	09.00-10.00	Mechanics and adhesion of thin films	Olaf van der Sluis
		10.15-11.15	Mechanics and adhesion of thin films	Olaf van der Sluis
		11.30-12.30	Mechanics and adhesion of thin films	Olaf van der Sluis
	PM	13.30-14.30	Ductile damage micromechanics	Thomas Pardoën
		14.45-15.45	Ductile damage micromechanics	Thomas Pardoën
		15.45-16.30	Course assessment (online multiple-choice test)	
		16.30	Closure and evaluation	