

Program EM course Nonlinear Material Mechanics

Location: University of Twente, hotel de Drienerburght

November 9-11, 2009: Drienerburght ROOM A

Monday, November 09	<i>Large Deformation Mechanics</i>	
09:00 - 09:30	Registration	
09:30 - 10:00	Introduction	Huétink
10:00 - 10:30	tensor/vector notation	Huétink
	<i>coffee break</i>	
10:45 - 11:30	Kinematics	Huétink
11.30 - 12.15	Stress and Balance Laws	van den Boogaard
	<i>Lunch</i>	
13:30 - 14:15	Thermodynamics	Huétink
14:15 - 15:00	Objectivity and Elasticity	van den Boogaard
	<i>coffee break</i>	
15.15 - 17.15	Practical training (hypo/hyperelasticity)	van den Boogaard
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Tuesday, November 10	<i>Constitutive modelling</i>	
09.00 - 09.45	Elasto-viscoplasticity	Huétink
09.45 - 10:30	Yielding and Hardening	van den Boogaard
	<i>coffee break</i>	
10.45 - 11.30	Multi-phase materials	Geijselaers
11:30 - 12:15	Phase transition (TRIP)	Geijselaers
	<i>lunch</i>	
13:30 - 14:15	Composites	Akkerman
14:15 - 15:00	Anisotropy	Huétink
	<i>coffee break</i>	
15.15 - 17.15	Practical training (anisotropy)	ten Thije
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Wednesday, November 11	<i>Particle Methods</i>	
09.00 - 09.45	Introduction to Particle Systems	Luding
09.45 - 10:30	Particle Systems for Beginners	Luding
10.30 - 11.15	Poster session / <i>coffee break</i>	
11.15 - 12.00	Molecular Dynamics for Particle Systems	Luding
12:00 - 12:45	Micro Macro Transition Methods	Luding
	<i>lunch</i>	
13:45 - 14:30	Avalanche flows for particle systems	Thornton
14:30 - 15:15	Shallow flow model	Thornton

November 16-18, 2009: Drienerburgh ROOM E+F

Monday, November 16	<i>Nonlinear solution techniques, damage</i>	
09:00 - 09:45	Introduction	Sluys
09:45 - 10:30	Nonlinear solution techniques	Sluys
	<i>coffee</i>	
10:45 - 11:30	Nonlinear solution techniques	Sluys
11.30 - 12.15	Plasticity models	Sluys
	<i>lunch</i>	
13:30 - 14:15	Computational Plasticity	Sluys
14:15 - 15:00	Continuum damage models	Sluys
	<i>coffee</i>	
15.15 - 17.15	Practical training	Simone
Tuesday, November 17	<i>Higher order continua, discontinuous models</i>	
09.00 - 09.45	Stability and localisation	Sluys
09.45 - 10:30	Explicit and implicit gradient-enhanced damage models	Simone
	<i>coffee</i>	
10.45 - 11.30	Partition of Unity-based enriched finite element methods (GFEM, PUFEM, XFEM...)	Simone
11:30 - 12:15	Partition of Unity-based enriched finite element methods (GFEM, PUFEM, XFEM...)	Simone
	<i>lunch</i>	
13:30 - 14:15	Continuous-discontinuous models	Simone
14:15 - 15:00	Continuous-discontinuous models	Simone
	<i>coffee</i>	
15.15 - 17.15	Practical training	Simone
Wednesday, November 18	<i>From particle systems to Continuum Theory</i>	
09.00 - 09.45	Finite Volume numerical methods (for shallow flow models)	Thornton/Luding
09.45 - 10:30	Micro Macro Transition Methods	Luding
	<i>coffee</i>	
10.45 - 11.30	Plastic flow models and hypoplasticity	Thornton/Luding
11:30 - 12:15	Particle Systems for Experts -> Solids	Luding
	<i>lunch</i>	
13:15 - 14:00	Mesoscopic solvers for continuum/fluid systems	Harting
14:00 - 14:45	Mesoscopic solvers for continuum/fluid systems	Harting
14:45 - 15:30	WRAP-UP Questions and Answers	ALL

EM-course Literature (Luding)

(<http://www2.msm.ctw.utwente.nl/sluding/publications.html>)

[1] S. Luding, *Introduction to Discrete Element Methods: Basics of Contact Force Models and how to perform the Micro-Macro Transition to Continuum Theory*, European Journal of Environmental and Civil Engineering - EJECE 12 - No. 7-8 (Special Issue: Alert Course, Aussois), 785-826 (2008),

[http://www2.msm.ctw.utwente.nl/sluding/PAPERS/luding_alert2008.pdf]

[2] S. Luding, *Cohesive frictional powders: Contact models for tension* Granular Matter 10(4), 235-246, 2008

[<http://www2.msm.ctw.utwente.nl/sluding/PAPERS/LudingC5.pdf>]

[3] S. Luding *Collisions & Contacts between two particles*,

in: *Physics of dry granular Media*, eds. H. J. Herrmann, J.-P. Hovi, and S. Luding, Kluwer Academic Publishers, Dordrecht, 1998

[<http://www2.msm.ctw.utwente.nl/sluding/PAPERS/coll2p.pdf>]

[4] M. Lätzel, S. Luding, and H. J. Herrmann,

Macroscopic material properties from quasi-static, microscopic simulations of a two-dimensional shear-cell, *Granular Matter* 2(3), 123-135, 2000

[<http://www2.msm.ctw.utwente.nl/sluding/PAPERS/micmac.pdf>]

[5] S. Luding, *Anisotropy in cohesive, frictional granular media*

J. Phys.: Condens. Matter 17, S2623-S2640, 2005

[<http://www2.msm.ctw.utwente.nl/sluding/PAPERS/jpcm1.pdf>]