

Agenda: PUBLIC PART of workshop 3 “AM process modelling”

Tuesday 21 November 08:30-12:00: Introduction to Thermomechanics

- 08:30-08:45 Introduction, Objective, Overall Agenda JHAT
- 08:45-10:30 Recapitulation of basic theory of thermo-mechanics together with small hand calculation exercises I JHAT
- 1D thermoelasticity
 - Hand calculation exercise 1: Bi-metallic frame
- 10:30-10:45 Break
- 10:45-12:00 Recapitulation of basic theory of thermo-mechanics together with small hand calculation exercises II JHAT
- 1D heat transfer
 - 3D thermoelasticity
 - Hand calculation exercise 2: Relation between volumetric and linear strain
- 12:00 -13:00 Lunch

Tuesday 21 November 13:00-18:00: Multiphysics Modelling of metal AM - I

- 13:00-14:00 Multi-physics, multi-scale modelling approaches to metal AM - I SAMOH
- Introduction to multi-scale multi-physics aspects of metal AM
 - Thermal simulations of AM – Material and geometrical non-linearity
 - Meso-scale Models :CFD simulations in metal AM – concepts and SoA
 - Macro-scale Models :Thermal simulations of scanning strategies
- 14:00-15:00 Multiphysics for topology optimization and simulation of additive processes THRS
- AM simulation case studies on COMSOL
 - Joining topology optimization & process simulation
 - Hands-on exercise on modelling thermal stresses
- 15:00-15:15 Break
- 15:15-18:00 Hands-on AM process modelling tutorials SAMOH
- Moving laser beam on a wafer
 - Thermal modelling of AM (adding 2-3 layers)

Wednesday 22 November 08:30-12:00: Multiphysics Modelling of metal AM - II

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| 08:30-10:00 | High temperature process modelling in MAGMASOFT | JEST |
| | <ul style="list-style-type: none">• Background and application• Inelastic deformations in high temperature processes• Simple examples illustrating post treatment in the SLM process | |
| 10:00-10:15 | Break | |
| 10:15-10:45 | Multi-physics, multi-scale modelling approaches to metal AM - II | SAMOH |
| | <ul style="list-style-type: none">• Thermo-mechanical simulations of AM• Moving heat source vs Layer-by-layer• Inherent Strain methods | |
| 10:45-11:55 | Hands-on AM process modelling tutorials | SAMOH |
| | <ul style="list-style-type: none">• Thermo-elastic modelling in a single layer• Stresses under a heating-cooling cycle (elasto-plasticity)• Removing constraints & deformations | |
| 11:55-12:00 | End of Workshop Note | JHAT |
| 12:00-13:00 | Lunch | |

Lecturers:

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| JHAT: | Professor Jesper Hattel, DTU Mechanical Engineering |
| JEST: | Dr. Jesper Thorborg, MAGMA and DTU Mechanical Engineering |
| SAMOH: | Dr. Sankhya Mohanty, DTU Mechanical Engineering |
| THRS: | M.Sc. Thure Ralfs from COMSOL |