MSE-666

Additive Manufacturing of Metals and Alloys

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Cursus	Sem.	Type
Materials Science and Engineering		Opt.

Language of teaching	English
Credits	2
Session	
Exam	Oral presentation
Workload	60h
Hours	**28**
Lecture	28
Number of positions	

Frequency

Every 2 years

Remark

Online via Zoom

Summary

This course is designed to cover a number of materials science aspects related to the field of additive manufacturing of metals and alloys, and to provide an in-depth review of corresponding fundamentals.

Content

1. Introduction to Additive Manufacturing (AM) of metals and AM methods (LPBF, EBM, DED, other methods such as binder jetting)

2. Powder fabrication and characterization

3. Interaction between beam (laser, e-beam) and material, heat formation and heat flow in the material

4. Fundamentals of rapid solidification of metals and alloys

5. Microstructure formation and control during AM

6. Residual stresses and warpage, defects (porosity, cracks) in AM parts

7. Post-treatments and associated microstructure evolutions

8. Mechanical properties of AM parts (static, cyclic), mechanical anisotropy

9. Material specific considerations: AM of steels, Ni alloys, Ti alloys, Al alloys; AM of precious metals and Cu alloys; AM of special materials (MMCs, gradient materials/multimaterials); Development/optimization of alloys

Keywords

metals and alloys, laser processing, electron beam melting, solidification, microstructure, post-treatment, mechanical properties, residual stresses

Learning Prerequisites

Required courses

Participants should be educated in materials science and engineering, physics, mechanical engineering or

physical chemistry to benefit the most from this course.

Assessment methods

Oral presentation