MSE-662

Laser Materials Processing

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Cursus	Sem.	Type
Advanced Manufacturing		Obl.
Materials Science and Engineering		Obl.

Language of teaching	English
Credits	2
Session	
Exam	Oral
Workload	60h
Hours	**28**
Courses	20
TP	8
Number of positions	

Frequency

Every 2 years

Remark

Next time: from 15.01.2018 to 22.01.2018

Summary

Provide understanding of the optical properties of materials, principles of laser operation and properties of generated light. Comprehension of basics of interaction between laser light and materials will allow analysis of the physics and chemsitry of laser processes.

Content

1) Principles of laser operation, types of lasers
2) Properties of the laser light: light controlled in time and space
3) Optical properties of the materials and their physical origin at atomic level
4) Fundamentals of light-matter interaction: linear/non-linear absorption, refractive index, influence of light properties such as wavelength or pulse length on the process
5) Laser light delivery: imaging, focusing, high resolution patterns – beam quality, resolution limits
6) Principles of laser processing: efficiency, importance of understanding heat flow, serial processing, parallel processing, …
7) Applications of laser processing: bending, welding, 3-D printing, multi-photon-processing, drilling, cutting, ablation, …

Note

The course supplies all the needed basics for in-depth understanding of light materials interaction and the induced phenomena resulting in materials transformation. Therefore all existing and coming laser processes can be understood.

Keywords

beam quality, wavelength dependent absorption, multiphoton processes, heat flow, laser bending, key-hole welding, laser cutting, drilling, trepanning, ultrashort-pulse processing, cold ablation, 2-photon polymerization, resolution limits

Assessment methods

Oral and oral presentation

Resources

Bibliography

D. Bäuerle, Laser processing and chemistry, Springer

Ressources en bibliothèque

- Laser processing and chemistry / Bäuerle