

MSE-662

Laser Materials Processing

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Cursus	Sem.	Type
Advanced Manufacturing		Opt.
Materials Science and Engineering		Opt.
Microsystems and Microelectronics		Opt.

Contact language	English
Credits	2
Session	
Exam	Oral
Workload	60h
Hours	28
Lecture	20
Practical work	8
Number of positions	

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 chemistry 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, ...

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](#)