Experimental Optical Spectroscopy

Module Name: Experimental Optical Spectroscopy

Module Number	T480006401	**Level**	Master	**Short Name**	EOS
Responsible Lecturers	Associate Professor PhD Jakob Kjelstrup-Hansen				
Department, Facility	SDU, Faculty of Engineering, Mads Clausen Institute and NanoSYD				
Course of Studies	Medical Microtechnology, Master				
Compulsory/elective	Compulsory	**ECTS Credit Points**	5		
Semester of Studies	2	**Semester Hours per Week**	4		
Length (semesters)	1	**Workload (hours)**	125		
Frequency	SuSe	**Presence Hours**	48		
Teaching Language	English	**Self-Study Hours**	77		
Consideration of Gender and Diversity Issues	☒ Use of gender-neutral language (THL standard) ☐ Target group specific adjustment of didactic methods ☐ Making subject diversity visible (female researchers, cultures etc.)				
Applicability	None				
Remarks	None				

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Course 1: Experimental Optical Spectroscopy

Course Number	T480006401	**Short Name**	EOS
Course Type	Lecture and lab exercises	**Form of Learning**	Presence
Mandatory Attendance	☒	**ECTS Credit Points**	5
Participation Limit	None	**Semester Hours per Week**	4
Group Size (practical training, exercises, …)	n. a.	**Workload (hours)**	125
Teaching Language	English	**Presence Hours**	48
Study Achievements („Studienleistung“, SL)	None	**Self-Study Hours**	77
SL Length (minutes)	n. a.	**SL Grading System**	n. a.
Exam Type	Oral exam	**Exam Language**	English
Exam Length (minutes)	20	**Exam Grading System**	7-scale grading

Learning Outcomes

Profound knowledge of the basis of the field of optics and physics of lasers and their unique properties and potential for applications in optical spectroscopy and material analysis.
The knowledge of the fundamentals of physical optics and optical high-resolution optical microscopy.

The ability to:

- design and construct simple optical systems
- estimate diffraction-limited imaging performance
- explain optical diagrams
- explain the main factors of laser beams: monochromaticity, collimation, and propagation.
- explain and use the most basic principles of laser physics and laser spectroscopy
- apply laser light in spectroscopic experiments

Competences:

- in solving realistic optical problems
- in developing applications using basic and advanced optical components
- critically discuss the strengths and weaknesses of various types of spectroscopy and their application to real-world analytical challenges
- critically analyse spectroscopic literature, understand experimental data and report their findings to their peers.

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	• build a spectrometer in response to a specific analytical challenge and understand the pros and cons of various choices required during this process. • In applying knowledge of optical spectroscopic techniques, such as UV-vis absorption, fluorescence, IR, and Raman to solve basic spectroscopic problems, both theoretically and practically
Participation Prerequisites	None
Contents	Geometrical, Instrumental and Wave Optics Light-mater interaction Optical Spectroscopy Linear and Nonlinear Optics Optical Microscopy and Sensing Explains the fundamentals of physical and geometrical optics as well as optical spectroscopy, in sufficient depth to enable students to solve realistic problems. Finally, it addresses the importance of the measurement and quantification of light in optical systems, covering radiometry, photometry and optical detection. It also introduces basic concepts of nonlinear optics.
Literature	Hecht, E: Optics, Addison-Wesley. Modern Spectroscopy 4th edition, J. Michael Hollas, John Wiley & Sons
Remarks	None