Universität Ulm

Master of Science Physics (PO 2017)

Wave and Particle Optics

Code	8812874609
ECTS credits	3
Attendance time	2
Language of instruction	English
Duration	1 Semester
Cycle	each Summer Semester
Coordinator	Dean of Physics
Instructor(s)	Prof. Harald Rose
Allocation of study programmes	Physik M. Sc., Wahlmodul, 1. oder 2. Semester
Recommended prerequisites	Undergraduate physics and mathematics, some experience in programming would be helpful
Learning objectives	Students who successfully passed this module • have enhanced their knowledge in wave and particle optics • know the limits of opitcal lenses such aberration and correction methods • know the difference beween optical lenses and electron lenses, and their advantages and disadvantages
Syllabus	The lecture will start with the principles and properties of Gaussian optics. Subsequently, the origin, the classification and the impact of the aberrations on the form of the image points are outlined. It will be shown that the performance of light#optical lenses and electron lenses differ considerably. As a consequence, light#optical methods for correcting the fundamental chromatic and spherical aberrations cannot be applied in electron optics. Feasible correction methods for compensating these aberrations will be discussed in detail for both light optics and electron optics. The lectures will be complemented with a practical course.

	The first part will consist of experiments on light optics. During the second part, the students will learn how to simulate the effect of aberrations in a transmission electron microscope (TEM).
Literature	Will be announced in class.
Teaching and learning methods	Block lecture with lab
Workload	30 hours Lecture (attendance time) 20 hours Exercise (attendance time) 40 hours self-study and examination preparation Total: 90 hours
Assessment	The credit points will be awarded once the written exam has been passed. No prerequisites are necessary for exam registration.
Grading procedure	The grade of the module will be the grade of the exam.
Basis for	Research work in microscopy