Department	SciTec
Degree programme	SI
Module name	**Introduction Optics**
Module number	**SciTec.2.295**
Study and Examination Regulations	ER-version 2026 (of 13/08/2025)
module type	compulsory module
Module coordinator	Prof. Dr. Robert Brunner
Module content	Fundamentals of Geometrical Optics: ▪ Fermat's Principle (principle of least time) ▪ Focal lengths, principal points, nodal points, ray direction, paraxial approximation ▪ Abbe's sine condition ▪ Imaging equations, "lens maker's formula" ▪ Aperture and field stop, pupils and windows; vignetting ▪ Aberrations (chromatic, spherical, coma, astigmatism, distortion, field curvature); correction of aberrations Fundamentals of Wave Optics: ▪ Huygens' Principle, Abbe theory ▪ Maxwell's equations, Fourier optics, Fresnel & Fraunhofer diffraction ▪ Measurement of the speed of light ▪ Polarization ▪ Diffraction by slit and grating; grating equation
Learning objectives	After participating in the module sessions, students will be able to: ▪ understand the fundamental concepts of geometrical optics and wave optics, and explain their principles, ▪ apply the acquired basic competencies to simple optical instruments.
Course type (lecture, seminar, exercises, practical course)	2 L – 0 S – 0 E – 0 P
Method(s) of instruction/ media used	Digital Projection or Display
Learning materials	Script
Recommended literature	▪ Pedrotti: Introduction to Optics. Addison-Wesley; 3rd edition, 2006 ▪ Hecht: Optics. Addison-Wesley; 4th edition, 2001 ▪ Feynman, R., LEIGTHON, R., & Sands, M. (1971). The Feynman. Lectures of Physics,
Level/ category	Master (category: 2)
Which semester (winter/ summer term)	winter term
Which semester during the programme	1
Requirements for attendance/ knowledge	Knowledge of mathematics, especially Fourier mathematics; basic knowledge of electrodynamics
Requirements for award of credit points (type, scope, duration of examination)	written examination (90 minutes)
ECTS credits	3
Work load in:	90 h of total work load, therefrom 30 of presence at university 30 h of self-study 30 h of preparation for exams
Usability of this module	Optical instruments, lasers, micro-optics
Frequency of offer	Every study year
Duration of module	1 semester
Location	Ernst-Abbe-Hochschule Jena - University of Applied Sciences Jena
Course Time	According to schedule
Language(s)	English
Latest change	15/09/2025