

Title: Design of Optical Systems			
Credits: 4 Semester: 1 Compulsory: Yes			
Format	Lectures 15	Guided project 15 Laboratory Tutorials	Private study 30
Lecturer(s): Marcin Leśniewski, Tomasz Kozacki			
<p>Objectives: The course gives theoretical and practical engineering information on optical systems and their designs. The students will gain both theoretical and practical knowledge for future independent design and analysis of an optical systems. During the course students will practice optical system design with OSLO software.</p> <p>Contents:</p> <ol style="list-style-type: none"> 1. Modeling of the optical systems using geometrical optics: ray tracing, paraxial, meridional and oblique. 2. Analysis of optical system aberrations. Computation of aberrations. Correction and optimization. Computer aided aberrations analysis of optical systems using software OSLO. 3. Optimization methods of optical systems. 4. Evaluation of an optical system. Criteria for optical quality evaluation: Rayleigh, Marechal, Hopkins. Merit Transfer Tunction. 5. Optimal aberration curves. Tolerances of aberrations. 6. Statistical method of determination of fabrication tolerances of optical elements. Material and decentration tolerances. 7. Overview of optical systems design: imaging systems, illumination systems, telescopes, eyepiece, magnification systems, photographic objectives (Triplet Anastigmat, Double-Gauss Lens, telephoto lens, Wide-Angle Lenses), microscope objectives, ZOOM lenses. 8. Advance methods of optical system designs: Gradient Index lenses, diffractive optical elements, optical systems for ultraviolet and infrared spectrum, atermalization. 			
<p>Abilities: Gaining knowledge of necessary theory on optical design, including basic theory of analysis of optical systems and practical aspects of some particular optical designs. Ability to use computer-aided design of an optical system with software OSLO.</p>			
<p>Assessment: 50% exam, 50% project</p> <p>Practical work:</p> <ol style="list-style-type: none"> 1. Advance methods of correction of chromatic aberration in optical systems, correction of secondary spectrum (apochromatization). 2. Correction of field curvature. 3. Optimization of aberrations of specified optical system. 			



4. Tolerances analysis. Determination of fabrication tolerances of optical systems.

Literature:

W. Smith, *Modern Lens Design*, McGraw-Hill Inc., New York 1992.

M.J. Kidger, *Fundamental Optical Design*, SPIE Press, New York 2000.

M.J. Kidger, *Intermediate Optical Design*, SPIE Press, New York 2000.

D. Malacara, Z. Malacara, *Handbook of Optical Design*, Marcel Dekker, New York 2004.

M. Leśniewski, *Projektowanie układów optycznych*, Wyd. Politechniki Warszawskiej, Warszawa 1990.

Manual of software OSLO, www.lambdares.com.

Manual of software GABAR.

Prerequisites: Fundamentals of geometrical, instrumental and wave optics, Fundamental Optical System Design.

