

Course “Constructing and development of opto-information systems”

Field of study: Applied and Computer Optics

Course level: Master

Specialization: 200400.68. Optical design

	Hours						
Semester	Workload	Lectures	Practical work	Lab.	Seminar	Independent studies	Tests
Spring	108	17	-	51	20	20	Exam

Abstract

Course “Constructing and development of opto-information systems” describes theoretical methods of design of different optical systems. Practical recommendations for main optical systems types design are presented. During the course big amount of practical exercises of optical systems design is considered.

Goals and Objectives of the Course

Knowledge of

- constructing principles of optical systems for various implementation;
- main types of optical systems for various purposes and its specifics;

Theoretical Skills

- be able to analyse and select optical elements for optical system design;
- be able to evaluate optical system image quality.

Practical Skills

- be able to use optical design software;
- be able to create a starting design;
- to be able to optimize an optical system;

Course prerequisites:

Knowledge in physics, geometrical and physical optics, stops and pupils, fundamentals of ray tracing, aberrations theory, ability to work with optical design software; basic knowledge of image quality criteria and skills of optical systems parameters calculation using paraxial equations.

Course structure

Volume of the course: 6.0 ECTS credits, 216 hours

Chapter	Types of activities					Total in hours
	Lectures	Practical work	Laboratory work	Seminar	Independent studies	
Concept of optical system constructing	8	-	12	10	10	40
Construction of optical systems for various purposes	9	-	39	10	10	68
Total:	17	-	51	20	20	108

Lectures

Hours	Theme
2	General principles of constructing and developing of optical systems
2	Bottom-up and top-down approach for selecting a starting point
2	Concept of optical system constructing
2	Optimization for different examples
2	Optical systems with “Speed-up” characteristics
2	Optical systems for safety and security, covert video observation
3	UV and IR optical systems
2	Implementation of aspherical surfaces. Design camera lens for mobile phone

Laboratory work

Hours	Theme
4	Starting the optical scheme
4	Synthesis of starting point for fish-eye lens with aplanatic and concentric surfaces
4	Optimization for different examples
4	Design of eyepiece
4	Optical module as a starting optical system
4	Design camera lens for mobile phone
4	Mirror and catadioptric systems design
3	Fresnel lenses
4	Zoom lenses
4	Design of pinhole lens
4	Design a symmetrical system
4	Design of relay lens
4	Telephotolens

Independent studies

- Preparing for practical laboratory works
- Writing reports
- Home work

Assessment Methods

- Test;
- Practical work;
- Laboratory work;
- Home tasks;
- Personal skills of a student are estimated;
- Exam.