COURSE DESCRIPTION CARD - SYLLABUS

Course name
Optical Constructions

Course

Field of study
TECHNICAL PHYSICS

Year/Semester
2/4

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
20

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars
15

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
dr Andrzej Jarosz

Wydział Inżynierii Materiałowej i Fizyki Technicznej

Instytut Badań Materiałowych i Inżynierii Kwantowej

ul. Piotrowo 3, 60-965 Poznań

email: andrzej.jarosz@put.poznan.pl

Responsible for the course/lecturer:

Prerequisites

Knowledge of experimental physics and mathematics at the undergraduate engineering course level. Basic knowledge of engineering graphics.

Skill in elementary physical problem solving, skill in acquiring information from listed sources, ability to make simple engineering drawing.

Understanding the necessity of personal competence development, readiness to cooperation in a team.

Course objective

1. Acquaintance of the students with the basic problems concerning structure, parameters and design process of optical instruments.

2. Development of skills in knowledge of physics application to the optical instruments design.

3. Team work ability development.

Course-related learning outcomes

Knowledge

Student, who has completed the course, is able to:

1. Explain structure and principle of operation of selected optical instruments - [K1_W01, K1_W08, K1_W10]

2. Define parameters of components commonly applied to optical instruments constructions - [K1_W01, K1_W08]

3. Define the rules of optical instruments design and tools applicable to this process - [K1_W05, K1_W10]

Skills

Student, who has completed the course, is able to:

1. Acquire from literature, databases and other sources information concerning materials, sub-assemblies and modules essential to develop simple optical instrument - [K1_U02]

2. Design simple optical instrument - [K1_U07, K1_U21]

3. Select materials, sub-assemblies and modules complying requirements of the technical specification as well as market economic conditions - [K1_U18, K1_U13]

Social competences

Student, who has completed the course:

1. Demonstrates creativity in realization of entrusted tasks and activity in personal competence development - [K1_K03]

2. Is able to work in a team, to carry out tasks arising from division of work in a team, to take responsibility for team work results - [K1_K01]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:
W01, W02, W03, U01, K01

Assessment of knowledge and skills demonstrated in written work during the last lecture in semester on the grounds of scored points:

3,0 50.1%-70.0%

4,0 70.1%-90.0%

5,0 from 90.1%

W01, U01, U02, U03, K01, K02

Assessment on the grounds of written design documentation:

- assessment of construction assumptions and parameters calculations correctness,

- assessment of materials, sub-assemblies and modules selection correctness,

- assessment of design documentation quality,

- assessment of materials, sub-assemblies and modules selection correctness, considering instrument costs in comparison with its parameters and functionality,

- assessment of project tasks solution originality,

- assessment of dividing up of work in a team.

Programme content

1. Geometric an wave optics fundamentals.

2. Properties of optical materials. Phenomena at a boundary of optical media. Coloured glass filters and their parameters.

3. Basic optical components. Lenses, mirrors, prisms - types and parameters. Polarizers - basic properties.

4. Image formation by mirrors, lenses and lens systems.

5. Optical aberrations.

6. Diffraction of light and its impact on image quality.

7. Interference of light. Antireflection coatings and multilayer dielectric mirror coatings. Interference filters.

8. Photometric and radiometric quantities.

9. Light sources.

10. Detectors of light.

11. Construction and parameters of selected optical instruments.

12. Dispersing prism and diffraction grating. Construction and parameters of optical spectrometer.

13. Precision mechanical components of optical instruments.

14. Basic rules of optical design and design documentation development.

15. Computer-aided design of optical instruments.

Teaching methods

Lecture: multimedia presentation during lecture and electronic documents containing presentation content in a condensed form made available to the students via e-mail.
Project classes: selected technical problem solving in the form of a individal tutorial and short multimedia presentations. Students work on their own on project documentation.

Bibliography

Basic

1. Instrumenty optyczne, F. Ratajczyk, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2002

2. Optyka, E. Hecht, Wydawnictwo Naukowe PWN, Warszawa 2012

3. Generacja i detekcja promieniowania optycznego, J. Godlewski, Wydawnictwo Naukowe PWN, Warszawa 1997

Additional

1. Principles of Optics, M. Born, E. Wolf, Cambridge University Press, 7th Ed., 2000

2. Lens Design Fundamentals, R. Kingslake, B. R. Johnson, Elsevier 2010

Breakdown of average student's workload

	Hours	ECTS
Total workload	74	3,0
Classes requiring direct contact with the teacher	37	1,5
Student's own work (preparation for project classes, preparation for test, project documentation preparation) [1]	37	1,5

[1] delete or add other activities as appropriate