POZNAN UNIVERSITY OF TECHNOLOGY



EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

COURSE DESCRIPTION CARD - SYLLABUS

Course name Optical Microscopy [S1ETI2>MO]

Course				
Field of study Education in Technology and Informatics		Year/Semester 2/3		
Area of study (specialization) –	Pr ge	rofile of study eneral academic		
Level of study first-cycle	Co Po	ourse offered in olish		
Form of study full-time	Ri	equirements lective		
Number of hours				
Lecture 15	Laboratory classes 15	Other 0		
Tutorials 0	Projects/seminars 0			
Number of credit points 2,00				
Coordinators	Le	ecturers		

Prerequisites

Knowledge of experimental physics and mathematics at the first-cycle engineering studies level. Skill in elementary physical problem solving, skill in acquiring information from listed sources. Understanding the necessity of continuous self-improvement.

Course objective

1. Acquaintance of the students with the basic geometric an wave optics problems with special consideration of optical microscope construction and application in science and technology. 2. Development of skills in knowledge of physics application to the analysis of optical instruments construction and operation. 3. Development of students abilities to acquire information and arrange self-education process.

Course-related learning outcomes

Knowledge:

1. Student, who has completed the course, is able to explain structure and principle of operation of selected optical instruments especially optical microscope

2. Student, who has completed the course, is able to define parameters of components commonly applied to optical microscopes constructions

Skills:

1. Student, who has completed the course, is able to acquire from literature, databases and other sources information concerning materials, sub-assemblies and modules essential to develop simple optical instrument

2. Student, who has completed the course, is able to calculate selected parameters of developed instrument

3. Student, who has completed the course, is able to prepare technical documentation of a simple optical setup connected with the field of microscope technology

4. Student, who has completed the course, is able to define parameters of the system for optical microscopy paying special attention to its application in selected fields of science and technology

Social competences:

1. Student, who has completed the course, demonstrates activity in professional competence self-improvement

2. Student, who has completed the course, understands the need of technical knowledge transfer to the fields important from the public interest point of view, like environmental protection, health care and is aware of the special role of technical university graduate in this process

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture - assessment of knowledge demonstrated during written test on the basis of scored points: 3.0 50.1%-70.0%

4.0 70.1%-90.0%

5,0 od 90,1%

Project - 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.

Programme content

- 1. Geometric an wave optics fundamentals
- 2. Basic optical components
- 3. Image formation by mirrors, lenses and lens systems
- 4. Optical aberrations
- 5. Photometric and radiometric quantities
- 6. Light sources for optical microscopes
- 7. Detectors of light, image acquisition systems
- 8. Construction of optical microscope
- 9. Polarization Microscopy
- 10. Phase Contrast Microscopy
- 11. Differential Interference Contrast Microscopy
- 12. Fluorescence Microscopy
- 13. Confocal Microscopy
- 14. New techniques in optical microscopy
- 15. Application of optical microscopy in science and technology

Course topics

- 1. Geometric an wave optics fundamentals
- 2. Properties of optical materials. Phenomena at a boundary of optical media.
- 3. Basic optical components. Lenses and mirrors types and parameters. Optical filters. Polarizers basic properties.
- 4. Image formation by mirrors, lenses and lens systems
- 5. Optical aberrations
- 6. Photometric and radiometric quantities

- 7. Light sources and their properties
- 8. Detectors of light, image acquisition systems
- 9. Construction of optical microscope. Types of optical microscopes.
- 10. Polarization Microscopy
- 11. Phase Contrast Microscopy
- 12. Differential Interference Contrast Microscopy
- 13. Fluorescence Microscopy
- 14. Confocal Microscopy
- 15. New techniques in optical microscopy
- 16. Application of optical microscopy in science and technology

Teaching methods

Lecture: multimedia presentation during lecture and electronic documents containing presentation content in a condensed form made available to the students via internet service eKursy. Project: selected technical problem solving in the form of 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. Mikroskopia optyczna, M. Pluta, Państwowe Wydawnictwo Naukowe, Warszawa 1982

Additional:

1. Springer Handbook of Lasers and Optics, Editors: Frank Träger, Springer Berlin Heidelberg 2012

Breakdown of average student's workload

	Hours	ECTS
Total workload	55	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00