COURSE DESCRIPTION CARD - SYLLABUS

Course name
Specialist subject III

Course

Field of study
Technical Physics

Year/Semester
3/6

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
elective

Number of hours

Lecture
15

Laboratory classes
75

Other (e.g. online)

Tutorials

Projects/seminars
30

Number of credit points

12

Lecturers

Responsible for the course/lecturer:
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Faculty of Materials Science and Technical Physics

ul. Piotrowo 3, 60-965 Poznań.

Responsible for the course/lecturer:

Prerequisites

Knowledge of experimental physics and basic specialist knowledge in the field of laser optics i quantum engineering.

Skills: the ability to solve simple physical problems based on the possessed knowledge, the ability to configure simple experimental systems and use them in measurements.

Social competences: understanding the need to broaden one's competences, readiness to cooperation as part of a team.

Course objective

1. Provide students with basic knowledge about the areas of application of laser techniques in various scientific, industrial, metrological, military, medical and life disciplines everyday life and requirements related to individual applications

2. Developing the ability to design laser systems with given parameters and application new technologies to solve specific technical and metrological problems.

3. Developing students' self-education skills and expanding interdisciplinary knowledge.

Course-related learning outcomes

Knowledge

As a result of the conducted classes, the student will have knowledge in the following areas:

1. knows the basic methods of shaping the characteristics of laser radiation [K1_W10]

2. knows the current state of advancement and is aware of the latest development trends in the field applications of laser technology in various fields of science and economy [K1_W13]

3. has basic knowledge of the operation of measuring apparatus [K1_W15]

Skills

As a result of the course, the student will acquire the following skills:

1. can define the problem related to the application of laser techniques and propose a method solutions [K1_U14]

2. is able to plan, carry out standard measurements, analyze and document test results concerning classical and quantum physical phenomena. [K1_U17].

3. can configure the basic measurement systems in the field of optics and optoelectronics [K1_U20].

Social competences

As a result of the conducted classes, the student will acquire the following social competences:

1.can work responsibly on the assigned task independently and in a team, assuming different roles in it [K1_K01]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Effect	Form of evaluation	Assessment criteria
W01, W02, W03	Exam	50.1% -70.0%(3)
	Assessment of activity in laboratory work	70.1% -90.0% (4)
	Project evaluation	from 90.1% (5)
U01, U02, U03	Exam	50.1% -70.0%(3)

	Assessment of activity in laboratory work	70.1% -90.0% (4)
	Project evaluation	from 90.1% (5)
K01	Assessment of activity in laboratory work	50.1% -70.0%(3)
		70.1% -90.0% (4)
		from 90.1% (5)

Programme content

1. Methods of shaping the spatial, temporal and spectral characteristics of light generated by the laser

2. Methods of stabilizing the work of lasers

3. Mechanisms of interaction of laser radiation with living tissue, review of lasers used in medicine and their basic properties, lasers in ophthalmology, laser lancet surgical, laparoscopy, lasers in oncology, photodynamic laser therapy, selective destruction tumor tissue

4. Laser analysis of environmental pollution, lidars

5. Laser spectroscopy of atoms, ions and molecules in scientific research, spectroscopy systems linear and nonlinear. Laser cooling, ion and atomic traps, quantum metrology

6. Laser cutting of materials and welding, types of lasers used, required parameters beams, power density calculation, laser engraving and drilling, microtechnology.

7. Information recording and reading by laser, CD recorders and players, printers laser, holography, methods of recording and reading a holographic image, types of holograms.

8. Laser distance meters. Distortion measurements, laser interferometry, anemometry, gyroscope fiber optic

9. Military applications of lasers, laser sights, chemical lasers, images created with laser beams, multimedia shows

Teaching methods

Bibliography

Basic

1. R. Jóźwicki "The laser technique and its application", Publishing House of the Warsow University of Technology, Warsaw 2009

2. A. Dubik "The use of lasers", WNT, Warsaw 1992

3. P. Fiedor, "Outline of clinical laser applications" Ankar Publishing House, Warsaw 1995

4. T. Kęcik "Lasers in ophthalmology", PZWL, Warsaw 1984 ...

5. W. Demtroder "Laser spectroscopy", PWN, Warsaw 1992

6. M. Nowicki "Lasers in electron technology and material processing", WNT, Warsaw 1978

7. W. Wyrebski, "Military laser technique", BWW, 1982

Additional

1. R. Jóźwicki "Fundamentals of photonic engineering" WNT, Warsaw 2008

2. B. Ziętek, "Lasers", Nicolaus Copernicus University Publishing House, Toruń 2008

3.W. W. Duley "Laser Processing and Analysis of Materials ", Plenum Press New York and London 1983

Breakdown of average student's workload

	Hours	ECTS
Total workload	240	12,0
Classes requiring direct contact with the teacher	130	6,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	135	6,0

[1] delete or add other activities as appropriate