COURSE DESCRIPTION CARD - SYLLABUS

Course name
Construction of research apparatus

Course

Field of study
Education in Technology and Informatics

Year/Semester
1/1

Area of study (specialization)

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars
15

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
dr hab. Bogusław Furmann, prof. PUT

email: boguslaw.furmann@put.poznan.pl

phone: +48 61 6653226

Faculty of Materials Science and Technical Physics

ul. Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge of physics, mathematics, electronics, mechanics, optics and vacuum technology on2nd degree studies in the field of Technical and IT Education. Skill solving technical problems based on the possessed knowledge, the ability to acquire information from indicated sources, the ability to make a technical drawing, ability to use CAD programs. Basic knowledge of the English language.Understanding the need to expand your knowledge and skills. Ability to cooperate within a small team.

Course objective

1. To acquaint students with the basic issues related to the construction and operation of devices research

2. Developing students' ability to apply knowledge to problem solving technical related to the construction and operation of research systems.

3. Developing students' ability to acquire knowledge independently.

Course-related learning outcomes

Knowledge

1. A student who has successfully passed the course knows the general structure and operation of the chosen ones devices in the field of measuring apparatus [K2_W06].

2. The student who passed the course knows the basic methods of constructing research devices [K2_W07].

3. A student who has successfully completed the course has the basic knowledge to design and presentation in the form of engineering graphics of a design of simple research devices [K2_W08]

Skills

1. A student who has successfully passed the course is able to define the basic parameters of a measuring device important from the point of view of the planned experiment and design a device with a set parameters [K2_U08].

2. A student who has successfully passed the course is able to design simple measuring systems by selecting eproper way - system elements in the form of research devices and patterns [K2_U09].

3. A student who has passed the course is able to plan and carry out solving experiments a specific physical problem and correctly develop and interpret their results [K2_U10].

4. A student who has passed the course is able to formulate hypotheses concerning the solution of problems engineering and propose a method of their verification [K2_U12].

5. A student who has passed the course is able to assess the usefulness and possibility of using the techniques experimental found during the study of your field of study to solve specific problems [K2_U13].

Social competences

1. A student who has passed the course is able to cooperate and work in a team to solve the problem the task given. [K2_K03].

2. A student who has passed the course is able to propose a solution to the task in an innovative way [K2_K06].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Effect	Form of evaluation	Assessment criteriaeducation
W01, W02, W 03, U04	Assessment of knowledge and skills	3.0 50.1% -70.0%

	demonstrated during the written test	4.0 70.1% -90.0%
	on the basis of the number obtained points:	5.0 from 90.1%
U01, U02, U03, U05, K01, K02	Assessment based on the draft in writing:	3.0 50.1% -70.0%
	- assessment of the correctness of construction assumptions and the way	4.0 70.1% -90.0%
	of presenting the solution.- assessment of unconventionality	5.0 from 90.1%
	and originality in the adopted design solutions,- assessment of	
	independence and effectiveness in searching for information sources	

Programme content

Method and technique of measuring basic physical quantities.

2. Noise and disturbances in signal processing systems. Noise reduction techniques.

3. Metrology with the use of lasers. Rangefinders, fiber optic sensors, gyroscopes, anemometers

4. Advanced techniques of optical spectroscopy. Atomic absorption spectroscopy, spectroscopy Fourier, absorption and emission laser spectroscopy, optical tomography, double resonance optical-microwave.

5. Systems for laser spectroscopy with time resolution and nonlinear spectroscopy.

6. Apparatus for testing air pollution

7. Radiospectroscopy and microwave spectroscopy.

8. Particle selectors and mass spectrometers.

9. Basic devices of quantum engineering. Ion traps, atomic traps, optical tweezers

Teaching methods

1.Lecture: presentation illustrated with examples given on the board, solving problems.

2. Project: individual student project work, discussion.

Bibliography

Basic

1. Building Scientific Apparatus, JH Moore, Ch.C. Davis, MA Coplan, Cambridge University Press 2009

2. Introduction to quantum metrology, W. Nawrocki, Publishing House Poznan University of Technology, Poznań 2007

3. Laser spectroscopy, W. Demtroeder, Polish Scientific Publishers PWN, Warsaw 1993

4. Optical instruments, F. Ratajczyk, Publishing House of the Wrocław University of Technology, Wrocław 2002

5. Electronics in a research laboratory, T. Stacewicz, A. Kotlicki, Polish Scientific Publishers PWN, Warsaw 1994

6. The art of electronics, P. Horowitz, W. Hill, WKŁ, Warsaw 2001

7. Introduction to magnetic resonance spectroscopy, J. Stankowski, W. Hilczer, Polish Scientific Publishers PWN, Warsaw 2005

Additional

1. Practical Optics, N. Menn, Elsevier Academic Press, Boston 2004

2. Experimental Physics, Vol. 1 - 6, S. Szczeniowski, Polish Scientific Publishers PWN Warsaw 1983

3. Laboratory Physics, Vol. 1-2, F. Kohlrausch, State Scientific Publishers 1961

4. Technique of Physical Experiment, EvAngerer, H. Ebert, State Scientific Publishers 1964

Breakdown of average student's workload

	Hours	ECTS
Total workload	90	3,0
Classes requiring direct contact with the teacher	48	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	20	1,0

[1] delete or add other activities as appropriate