COURSE DESCRIPTION CARD - SYLLABUS

Course name
Sensor Technologies [S2FT2>TC]

Course

Field of study
Technical Physics

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

1,00

Coordinators

dr inż. Semir El-Ahmar
semir.el-ahmar@put.poznan.pl

Lecturers

Prerequisites

Basic knowledge of solid state physics, nanotechnology and vacuum technologies. Ability to obtain information from indicated literature sources.

Course objective

1. Providing students with knowledge about the use of modern materials with specific properties to construct sensors for a wide range of applications. 2. Providing students with knowledge about specific physical phenomena used in various types of sensing elements. 3. To familiarize students with the principles of operation of selected types of sensors commonly used in industry and scientific research, together with a discussion of their production technology.

Course-related learning outcomes

Knowledge:
The student will be able to:
1. Explain the operation of selected sensor devices based on known physical phenomena and characteristic material properties.
2. Explain the principles of selection of materials and production technology of selected detection

devices, as well as classify them depending on the application.

Skills:
The student will be able to:
1. Identify and characterize detection devices commonly used in industry.
2. Assess the usefulness and effects related to the functioning time of various types of sensors in given working conditions.
3. Specify the operational parameters of selected sensors.
4. Characterize the sensor market depending on the type of device.

Social competences:
The student will be able to:
1. Think in a creative and entrepreneurial way when approaching the problem of constructing sensing elements from the physical, technological and economic perspective.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Assessment of knowledge and skills in the form of a written and/or oral exam based on the explanation of selected topics
Assessment criteria:
3.0 (50.1%-60.0%),
3.5 (60.1%-70.0%),
4.0 (70.1%-80.0%),
4.5 (80.1%-90.0%),
5.0 (> 90.1%)

Programme content

1. Construction, operation and manufacturing techniques of selected types of sensors.
2. Materials engineering in sensor technology.
3. Physics in sensor technology.
4. Classification of selected types of sensors depending on their application.
5. Operating parameters of sensors and methods of their determination.

Course topics

1. Sensor, definition, sensor components.
2. History of the development of sensor technologies.
3. Division and construction of various types of sensor elements.
4. Functional materials in sensor technology, their electrical and physico-chemical surface properties.
5. Physical sensors, principles of operation, structures and measurement methods.
6. Chemical sensors, idea, structure and applications.
7. Special sensors for operation in extreme environments, requirements and prospects.
8. Assessment and criteria of sensor operation stability, measurement errors.
9. Sensor market, future forecasts.

Teaching methods

Multimedia presentation, discussion, problem-based learning, Oxford discussion.

Bibliography

Basic:
1. Lecture materials available on the eKursy platform (in Polish)
2. D. K. Schroder, Semiconductor Material and Device Characterization, 2006 John Wiley & Sons, Inc.
3. S. Tumański, Measurement technique, PWN, Warsaw 2024
4. Vacuum Technique, A. Hałas, OWPW, Wrocław, 2017

Additional:
1. D. Halliday, R. Resnick, J. Walker, Fundamentals of physics vol. 1-5, PWN, Warszawa 2003 (1st ed.),

2015 (2nd ed.)
2. L. J. van der Pauw, A method of measuring specific resistivity and Hall effect of discs of aribtrary shape, Philips Research Reports 13 (1) (1958)
3. S. Tumański, Modern magnetic field sensors - a review, Przegld Elektrotechniczny, 89, 10, 2013
4. High vacuum technique, J. Groszkowski, PWN, Warsaw, 1978

Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1,00
Classes requiring direct contact with the teacher	15	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	10	0,50