COURSE DESCRIPTION CARD - SYLLABUS

Course name
CHARACTERIZATION OF FUNCTIONAL MATERIALS BY RAMAN SPECTROSCOPY

Course

Proposed by Discipline
Materials engineering

Year/Semester
II/3, III/5

Type of studies
Doctoral School

Course offered in
English

Form of study
full-time

Requirements
elective

Number of hours

Lecture
4

Tutorials

Projects/seminars

Number of credit points

1

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:

Prerequisites

Knowledge: basic knowledge of physics and chemistry, including elements of optics, atomic and molecular physics and solid state physics, basic knowledge of statistical processing of data.

Skills: ability to make qualitative and quantitative analysis of the experimental results, the ability to independently obtain information on a given topic.

Social competencies: understanding of the need to expand their competences, showing responsibility for their own work and work in a team.

Course objective

1. Presentation of PhD students techniques of Raman spectroscopy and micro-Raman microscopy commonly used for the characterization of the functional materials.
2. Develop students' ability to formulate and solve problems in physics and engineering.

Course-related learning outcomes

Knowledge

A PhD student who graduated from doctoral school knows and understands:
1) the basic concept of scattering spectroscopy methods, it can specify the information to provide these methods and compare them with other methods used in characterization materials, [P8S_WG/SzD_W01], [P8S_WG/SzD_W03]
2) about interaction of light with matter and can associate it with the relevant experimental techniques (Raman and micro-Raman) and is able to interpret the experimental results. [P8S_WG/SzD_W03]

Skills

A PhD student who graduated from doctoral school can:
1) measure using optical spectroscopy techniques - scattering (Raman spectroscopy), [P8S_UW/SzD_U01]
2) analyze the experimental results obtained and verified them with the literature. [P8S_UW/SzD_U02]

Social competences

A PhD student who graduated from doctoral school is ready to:
1) precisely formulated problems and suggest ways to resolve them, including in collaboration with team members, [P8S_KK/SzD_K02]
2) ability to acquire critical knowledge from a variety of sources. [P8S_KK/SzD_K03]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

PQF code	Methods for verification of learning outcomes	Assessment criteria
W01, W03	Written exam	3.0: 50.1%-70.0% 4.0: 70.1%-90.0% 5.0: >90.1%
U01, U02	Written exam	as above
K02, K03	Written exam	as above

Programme content

1. Techniques for measuring the Raman scattering spectra (the classical techniques; SERS, SERRS, TERS; Raman microscopy).
2. Raman imaging (Raman mapping).
3. The use of Raman spectroscopy in the study of functional materials (carbon materials, biological materials, semiconductor materials).

Teaching methods

Lecture: multimedia presentation including illustrations and examples.

Bibliography

Basic

1. Introductory to Raman Spectroscopy, John R. Ferraro, Kazuo Nakamoto, Chris W. Brown, Academic Press, Elsevier, 1994.

2. Modern Raman Spectroscopy – A Practical Approach, Ewen Smith, Geoffrey Dent, John Wiley & Sons, 2005.

Additional

1. Raman Microscopy – Development and Applications, George Turrel, Jacques Corset, Elsevier, 1996.

Breakdown of average student's workload

	Hours	ECTS
Total workload	18	1.0
Classes requiring direct contact with the teacher	8	0.5
Student's own work (literature studies, preparation for tutorials, project preparation) [1]	10	0.5

[1] delete or add other activities as appropriate