A COURSE SYLLABUS – DOCTORAL SCHOOL

REGARDING THE QUALIFICATION CYCLE FROM 2024/2025 TO 2027/2028

GENERAL INFORMATION ABOUT COURSE	
Course title	***DOCTORAL SEMINAR***
Name of the unit running the course	Doctoral School at University of Rzeszów
Type of course *(obligatory, optional)*	obligatory subject
Year and semester of studies	year I -IV, semester: I - VII
Discipline	Materials Engineering
Language of Course	Polish/English language
Name of Course coordinator	**dr hab. Ireneusz Stefaniuk, prof. UR**
Name of Course lecturer	**dr hab. Ireneusz Stefaniuk, prof. UR**
Prerequisites	The scope of knowledge stemming from the curriculum of the master's degree in materials engineering. Knowledge of the English language at the level making it possible to use foreign language sources of scientific information,

BRIEF DESCRIPTION OF COURSE
(100-200 words)

The doctoral seminar is aimed at preparing the PhD student to conduct scientific research independently, under the substantive supervision of the supervisor, and to edit scientific papers. The doctoral seminar should prepare the doctoral student to formulate research hypotheses, perceive and verbalise scientific problems. The specific aim is: to acquire the ability to conduct a scientific discussion, to raise the level of inference in a chosen scientific field, to develop the ability to communicate with scientists from outside their discipline, to acquire knowledge, skills and social competences necessary for the proper development of a doctoral dissertation. To develop the ability to work in the laboratory, to develop one's own research hypotheses, to compose research methodologies and to translate the conclusions of one's own experimental results into a form of presentation and as scientific articles. To be able to disseminate one's own acquired knowledge and the results of one's own work to the sphere of the interface between science and economy through their presentations in scientific discourses and professional meetings.

COURSE LEARNING OUTCOMES AND METHODS OF EVALUATING LEARNING OUTCOMES

Learning outcome	The description of the learning outcome defined for the course	Relation to the degree programme outcomes (symbol)	Learning Format (Lectures, classes,...)	Method of assessment of learning outcomes (e.g. test, oral exam, written exam, project,...)
Knowledge (no.)	knows and understands, has knowledge			
P8S_WG1	in the field of materials engineering and general issues in related disciplines, current scientific achievements, including worldwide, and general issues and selected specific issues - specific to EPR spectroscopy;	**P8S_WG**	seminar	oral statement, discussion
P8S_WG2	focus of development and latest discoveries of scientific research in the field of materials research using the EPR method, including worldwide;	**P8S_WG**	seminar	oral statement, discussion

P8S_WG3	used and specialised terminology in materials engineering and related disciplines, also in a foreign language;	**P8S_WG**	seminar	oral statement, discussion
Skills (no.)	can			
P8S_UW1	on the basis of his/her knowledge from various fields of science, is able to identify and solve a research problem in the field of materials engineering, define the aim of research, formulate a hypothesis and the subject of research and make conclusions on the basis of research results;	**P8S_UW**	seminar	oral statement, discussion
P8S_UW2	select and use scientific literature to properly diagnose and solve research problems and innovative actions in connection with conducted scientific work;	**P8S_UW**	seminar	oral statement, discussion
P8S_UW3	critically analyse and evaluate the results of scientific research conducted and published in scientific papers and be able to assess their contribution to the development of the discipline of Materials Science and Engineering;	**P8S_UW**	seminar	oral statement, discussion
P8S_UK6	publicly present the results of scientific research and participate in discussions on scientific and professional topics in an international environment, using a foreign language at the B2 level of the European Language Education System;	**P8S_UK**	seminar	oral statement, discussion
Social competence (no.)	is ready to			
P8S_KK1	critically appraise the achievements within the scientific discipline of materials engineering and critically evaluate the contribution of his/her own research activity to the development of this discipline;	**P8S_KK**	seminar	oral statement, discussion
P8S_KK3	solves cognitive and practical problems in the field of materials research using the EPR method with his/her knowledge;	**P8S_KK**	seminar	oral statement, discussion

LEARNING FORMAT – NUMBER OF HOURS						
Semester (no.)	Lectures	Seminars	Lab classes	Internships	others	ECTS
I - VII	-	-	-	-	**7 x 15 hrs - 105 hrs.**	14

METHODS OF INSTRUCTION

Laboratory work; data analysis with specialised computer programmes; preparation of presentations; scientific discussion and debate.

COURSE CONTENT

semester I
- Analysis of scientific and technical literature on the powder coating annealing process and the EPR technique.
- Determination of laboratory research methodology
- Determination of the topic of the thesis, the subject and objectives of own research.

semester II
- Collection of powder coatings samples.
- Conducting laboratory experiments using the EPR technique.
- Development of an outline concept for the dissertation.

semester III
- Analysis of the experimental data obtained.
- Identification of factors influencing the structure of paint particles during the annealing process.
- Construction of the theoretical part of the thesis - selection of literature.

semester IV
- Development of the final strategy for optimisation of the annealing process.
- Substantive preparation for practical implementation of research.

semester V
- Continuation of research work.
- Conducting research proper.

semester VI
- Compilation of own research results.
- Inference and interpretation of results.

semester VII
- Preparation of scientific articles.

-Interpretation of obtained research results and formulation of final conclusions.
- Writing a dissertation.

COURSE ASSESSMENT CRITERIA

A prerequisite for credit is active participation in the seminar consisting in asking questions and leading a substantive discussion on the presentation of research results presented during the seminar.

I sem. - definition of the topic of the thesis, collection of literature on the subject, elaboration of the results being the effect of laboratory work (pilot studies);

II sem. - development of results from laboratory work (pilot studies), development of an outline of the dissertation concept, preparation of an individual research plan, co-teaching;

III sem. - preparation of a scientific paper, progress in the implementation of the research plan, active participation in a scientific conference;

IV sem. - preparation of a scientific paper, progress in the implementation of the research plan, co-participation in teaching activities, co-teaching;

The prerequisite for obtaining credit after semesters V, VI, VII and VIII is the actual realisation of tasks from the programme content of the research plan;

TOTAL PhD STUDENT WORKLOAD REQUIRED TO ACHIEVE THE INTENDED LEARNING OUTCOMES – NUMBER OF HOURS AND ECTS CREDITS	
Activity	Number of hours
Scheduled course contact hours	**105 hrs. - 7 x 15 hrs**
Other contact hours involving the teacher (consultation hours, examinations)	**6**
Non-contact hours – student`s own work (preparation for classes or examinations, project, etc.)	**309**
Total number of hours	**420**
Total number of ECTS credits*	**14**

INSTRUCTIONAL MATERIALS	
Compulsory literature:	1 A. ABRAGAM, B. BLEANEY, ELECTRON PARAMAGNETIC RESONANCE OF TRANSITION IONS 1986. 2 JAN STANKOWSKI, ANDRZEJ GRAJA; INTRODUCTION TO QUANTUM ELECTRONICS. WKŁ. 1972. 3. J. STANKOWSKI, W. HILCZER INTRODUCTION TO MAGNETIC RESONANCE SPECTROSCOPY PWN 2005. 4. JOHN ASHLEY WEIL, JAMES R. BOLTON, ELECTRON PARAMAGNETIC RESONANCE: ELEMENTARY THEORY AND PRACTICAL APPLICATIONS, JOHN WILEY AND SONS, 2007. 5 Z. KĘCKI, FUNDAMENTALS OF MOLECULAR SPECTROSCOPY, PWN 2013. 6. P. ATKINS, DE P. JULIO, J. KEELER, PHYSICAL CHEMISTRY, PWN 2022.
Complementary literature:	1. January Weiner: Techniques for writing and presenting natural science papers. PWN Scientific Publishers, 2018 2. Scientific journals in Polish and foreign languages in the field of EPR spectroscopy,

*(1 ECTS CREDIT CORRESPONDS TO 25 - 30 HOURS OF THE TOTAL WORKLOAD OF A DOCTORAL STUDENT, NEEDED TO ACHIEVE THE ESTABLISHED EFFECTS).

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Date and signature of the Course lecturer

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Approved by the Head of the Department or an authorised person