

# **Warsaw University of Technology | Doctoral School No. 1**

**Course offered in the Doctoral School No. 1  
– Spring semester of the 2021/2022 academic year**

<b>TITLE</b>
Applications of materials engineering in the diagnostics of industrial devices
<b>CONDUCTING UNIT</b>
Doctoral School No. 1
<b>SCIENTIFIC DISCIPLINE</b>
Materials engineering
<b>IMPLEMENTING UNIT</b>
109000 - Faculty of Materials Science and Engineering
<b>SUMMARY DESCRIPTION</b>
The goal of the education is to obtain by Ph.D. students the ability to use their knowledge in the field of material engineering to analyze the technical condition of industrial equipment and facilities, in the context of extending their life and reducing the risk of failures related to material degradation. It is connected, among others, with the ability to select the appropriate testing methodology and analysis of the results of the conducted research and to formulate appropriate conclusions and recommendations for owners of industrial installations. The aim of education is also to familiarize students with the possibilities of available research methods (destructive and non-destructive), taking into account modern and advanced methods, current research trends, and standards.
<b>FULL DESCRIPTION</b>
The aim of education in this subject is to obtain by Ph.D. students the ability to use their knowledge in material engineering, analyze the technical condition of industrial equipment and facilities in the context of extending their life, and reduce the risk of failures related to material degradation. In this context, students will acquire the ability to select the appropriate testing methodology, analyze the results and formulate appropriate conclusions and recommendations for owners of industrial installations. The training aims to familiarize students with the possibilities of available testing methods (both destructive and non-destructive), including modern and advanced methods, taking into account current standards and testing trends.

During the course, doctoral students will also learn the possibilities of the available destructive and non-destructive testing methods in technical diagnostics and current trends in their application, and the concept of RBI processes and operational control programs.

Students will have the opportunity to verify and consolidate the knowledge obtained during the course during the final project preparation. The task of the project will be to develop guidelines for the research methodology of the selected industrial facility/installation, taking into account its operating parameters, appropriate acceptance criteria, and current standards. Papers will be prepared in small subgroups, and their results will be jointly presented and discussed in the course of seminars.

### LITERATURE

- 1) API 510 Pressure Vessel Inspection Code: Maintenance Inspection, Rating, Repair, and Alteration
- 2) ASME Boiler and Pressure Vessel Code V: Nondestructive Examination
- 3) PED 2014/68/EU: Pressure Equipment Directive
- 4) ISO/IEC 17025 Standard: General requirements for the competence of testing and calibration laboratories
- 5) EN ISO 9712 Standard: Non-destructive testing — Qualification and certification of NDT personnel
- 6) Normative documents concerning the application of particular testing methods

### LEARNING OUTCOMES

Learning outcomes:

1. Knowledge of the basics and goals of technical diagnostics
2. Knowledge of the possibilities of the available destructive and non-destructive testing methods and the current trends in their application
3. Knowledge of the concept of RBI processes and operational control programs
4. Ability to use the knowledge in material engineering to analyze the technical condition of industrial equipment and facilities
5. Ability to select testing methodology depending on the diagnosed industrial facility
6. Ability to analyze the results of industrial testing and to formulate appropriate conclusions and recommendations
7. Ability to select appropriate acceptance criteria based on current normative documents
8. Improving teamwork skills
9. Presentation of own concepts, analyzes, and guidelines as well as the ability to conduct a substantive discussion in this area

### ASSESSMENT METHODS AND CRITERIA; COURSE COMPLETION FORM

Final project with a presentation at the seminar - development of guidelines for the testing methodology of a selected industrial facility/installation, taking into account its operating parameters, appropriate acceptance criteria, and current standards.

### LANGUAGE OF THE COURSE

### ECTS CREDITS

English

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TYPE OF CLASSES	NUMBER OF HOURS	COURSE INSTRUCTOR
Lecture	15	Łukasz Sarniak, dr inż.
Seminarium (SEM)	10	Łukasz Sarniak, dr inż.
ADDITIONAL INFORMATION		
<p>The course is realized within the SEED Project – NAWA STER Programme. Therefore, in order to take part in it, each participant is obliged to deliver to the PhD Students' Office the Declaration of the Project Participant concerning personal data. The document must be submitted until <b>March 1, 2022</b>.</p> <p>The document can be found here:  <a href="https://www.sd.pw.edu.pl/sd_en/SEED-NAWA-STER">https://www.sd.pw.edu.pl/sd_en/SEED-NAWA-STER</a> </p>		