



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Methodology for Solving Engineering Problems [S1DSwB1>MRPI]

---

### Course

Field of study

Data Science in Business

Year/Semester

3/6

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-cycle

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

---

### Number of hours

Lecture

0

Laboratory classes

0

Other

0

Tutorials

15

Projects/seminars

0

### Number of credit points

1,00

---

### Coordinators

dr hab. inż. Agnieszka Misztal prof. PP  
agnieszka.misztal@put.poznan.pl

### Lecturers

### Prerequisites

Students should have basic knowledge in engineering and methods for analyzing technical problems, as well as the ability to search for and interpret technical information. Familiarity with basic IT tools supporting the design process and the ability to work in teams and communicate analysis results will be significant advantages. An understanding of the general principles of executing technical projects and the engineering project life cycle will also be useful.

### Course objective

The objective of the course is to prepare students for independently and collaboratively developing engineering projects by learning the methodology for solving technical problems, analysis, and implementation of solutions. Students will learn to create project documentation in accordance with formal and technical requirements, as well as use appropriate tools supporting the engineering design and analysis process. An important aspect will also be developing teamwork skills, project and schedule management, and effectively presenting results. The course aims to not only provide theoretical knowledge but also to develop practical competencies necessary for the realization and defense of an engineering project.

### Course-related learning outcomes

#### Knowledge:

Characterizes the methodology for solving engineering problems in the context of preparing a thesis project and professional internships [DSB1\_W01].

Describes the principles of defining technical problems, planning and executing engineering projects, and preparing project documentation [DSB1\_W07].

#### Skills:

Selects methods for analyzing and solving engineering problems, considering technical and business requirements [DSB1\_U01].

Selects and analyzes available data and sources of information needed for preparing the thesis project [DSB1\_U02].

Designs the structure and timeline of the engineering project, considering resource and risk management [DSB1\_U03].

Formulates the goals and assumptions of the thesis project in a precise manner, consistent with engineering research methodology [DSB1\_U05].

Applies analytical and research tools in evaluating engineering solutions, including SWOT analysis, FMEA, and cost analysis [DSB1\_U06].

Assesses the feasibility and risks of the proposed engineering solutions [DSB1\_U10].

Creates technical documentation for the project in accordance with academic and industrial standards [DSB1\_U12].

Plans practical activities within the company as part of preparation for implementing the thesis project [DSB1\_U13].

Effectively collaborates in project teams, communicating project assumptions and results [DSB1\_U14].

Presents and justifies the concept of the engineering project, considering its goals, assumptions, and potential benefits [DSB1\_U15].

#### Social competences:

Critically analyzes their own knowledge and skills in the execution of engineering projects, striving for continuous improvement [DSB1\_K01].

Utilizes theoretical and practical knowledge to solve engineering problems and make project decisions [DSB1\_K02].

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The evaluation of learning outcomes will be based on the systematic assessment of students' progress in identifying and defining engineering problems, developing the project concept, and preparing for professional internships. The assessment will include both individual and group work, considering the quality of problem analysis, the accuracy of formulated assumptions, and the clarity of their presentation. Students will be required to develop and present a proposal for the engineering project topic, including its goal, scope, and initial technical assumptions.

#### Assessment Criteria:

- Problem Analysis and Initial Project Assumptions - the student should present a clear and justified analysis of the engineering problem, its significance, and possible solutions (30%).
- Development of the Engineering Project Topic - the student should formulate the topic of their project, define the goal, scope, and initial technical and methodological assumptions (40%).
- Preparation for Professional Internships - the student should demonstrate knowledge of internship requirements and specifics in the context of their project, as well as present a preliminary action plan in the company (20%).
- Final Presentation - the ability to present the results, justify the choice of the topic, and ensure clarity and logic in the argumentation will be assessed (10%).

The final grade will be the sum of points earned in each category, and passing the course requires meeting the minimum requirements in each of them.

### Programme content

The course covers topics related to the methodology for solving engineering problems in the context of preparing for an engineering project and professional internships. Students will learn the principles of defining technical problems, planning engineering projects, and creating project documentation. The course will also address basic methods for analyzing and evaluating engineering solutions, as well as

practical aspects of project implementation in an industrial environment. Additionally, the course will prepare students for professional internships by identifying challenges and expectations of companies towards future engineers.

## Course topics

1. Introduction to the Course
  - o Course objectives and scope
  - o The importance of engineering problem-solving methodology
  - o The role of engineering projects in the education process
2. Characterization of Engineering Problems
  - o Defining technical problems
  - o Identifying needs and constraints
  - o Case analysis
3. Methodology for Preparing an Engineering Project
  - o Structure of the engineering project
  - o Ways to formulate project goals and assumptions
  - o Project scope and implementation stages
4. Methods for Analyzing and Evaluating Engineering Solutions
  - o Overview of research methods used in engineering
  - o SWOT analysis, FMEA, cost-benefit analysis
  - o Feasibility and risk assessment
5. Engineering Project Documentation
  - o Standards and formal requirements
  - o Structure and format of the technical report
  - o Components of project documentation
6. Engineering Project Management
  - o Planning the schedule and resources
  - o Project management tools
  - o Risk and problem management
7. Collaboration with Industry and Preparation for Professional Internships
  - o The role of the engineer in the industrial environment
  - o Requirements and expectations of companies towards students
  - o Planning practical activities within the company
8. Presentation of the Engineering Project Concept
  - o Discussion of project topic proposals
  - o Discussion of project goals and scope
  - o Preliminary feasibility analysis
9. Practical Workshop - Developing the Project Concept
  - o Refining the project topic and goals
  - o Developing initial technical assumptions
  - o Preparing for the project implementation
10. Summary and Final Presentation
  - Evaluation of goal achievement
  - Presentation of project topics and action plans
  - Conclusions and recommendations at the project preparation stage

This course outline focuses on equipping students with the knowledge and skills needed to work on engineering projects and internships, while also fostering practical and analytical competencies.

## Teaching methods

The teaching methodology for the course will include practical workshops, case studies, project-based methods, group work, moderated discussions, brainstorming sessions, interactive lectures, and individual consultations. These methods will encourage active learning, critical thinking, and collaboration, providing students with a comprehensive understanding of engineering project management and problem-solving.

## Bibliography

Basic:

Czakon W. (red.), Podstawy metodologii badań w naukach i zarządzaniu, Oficyna a Wolters Kluwer

Additional:

Internal regulatory provisions preparing students for the execution of their diploma thesis.

#### 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/<br>tutorials, preparation for tests/exam, project preparation) | 10    | 0,50 |