COURSE DESCRIPTION CARD - SYLLABUS

Course name
Methods of science for engineers

Course

Field of study
Inżynieria Materiałowa

Year/Semester
2/3

Area of study (specialization)

Profile of study

Level of study
Second-cycle studies

Course offered in
polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
Ewa Więcek-Janka, dr hab. inż.

WIZ ul. Rychlewskiego 2, Poznań

Responsible for the course/lecturer:
Marcin Nowak, dr inż. WIZ, ul Rychlewskiego 2, Poznań

Prerequisites

A student starting this subject should have basic knowledge of the functioning of an individual in society and be familiar with elementary concepts in the area of knowledge about thinking and culture. He should have the ability to analyze and reason, and be skilful in obtaining information from the indicated sources. He should also be ready to cooperate as part of the team. In terms of social competences, the student must present attitudes such as honesty, responsibility, perseverance, cognitive curiosity, creativity, personal culture, respect for other people.

Course objective

Acquiring the knowledge and skills necessary to consider issues of science and scientific methods, shaping a humanistic perspective in perceiving reality.

1. To provide students with the basics of distinguishing scientific knowledge from other types of knowledge.

2. Developing students' thinking and problem-solving skills.

3. To teach the basics of analyzing aspects of the subject matter when making decisions

engineering.

4. Shaping students' teamwork skills.

Presentation of the conceptual and theoretical categories constituting the methodology of social sciences, including the methodology of sociological research as a scientific discipline. Review of the most important methodological orientations and their consequences for the comprehension of tasks - the subject and cognitive procedures

Course-related learning outcomes

Knowledge

The student has knowledge of ethical codes concerning engineering, design and implementation works - The student describes the nature of engineering and social sciences and their place in relation to other sciences

- The student lists the main elements of the methodology of social sciences (from the point of view of providing students with the foundations for research activity); K2_W12, K2_W13,

- The student characterizes in depth methods and tools, including techniques of data acquisition in engineering and social sciences; K2_W12, K2_W13,

- Student explains the use of methods and tools specific to engineering to describe social institutions and structures (including relations between them and internal processes); K2_W12, K2_W13,

- Student identifies and defines the conceptual and theoretical categories constitutive of the methodology of engineering sciences; K2_W12, K2_W13,

- The student lists and describes the most important methodological orientations and their consequences for the understanding of tasks (cognitive objects and procedures); K2_W12, K2_W13.

Skills

- The student uses the acquired theoretical knowledge (knowing the interaction of theory and methods in research) and obtains data using a selected method [knowing the consequences of the adopted research assumptions and theoretical models (including selected formal models) for the choice of research strategy]; K2_U02, K2_U07,

- The student uses engineering and sociological knowledge in practice (diagnoses engineering and social problems, interprets and explains the phenomena and relations between them); U07, K2_U14, K2_U15,

- The student analyzes specific engineering and social phenomena, has the ability to understand and analyze specific engineering and social problems); K2_U14, K2_U15.

Social competences

- The student is aware of the existence and importance of following the Ethical Principles in engineering and social research; K2_K02, K2_K03,

- The student is sensitive to ensuring the quality of collected data and the correctness of analytical procedures and inference; K2_K02, K2_, K2_K07,

- The student works in a team, is able to properly define priorities, enabling the implementation of the set task K2_K02, K2_K03, K2_K04, K2_K07.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Asking questions during the lecture to check the level of mastery of the previously presented issues

Summative assessment:

Final test. Required at least 55% correct answers.

Programme content

The concept of the scientific method in general (in science), in sociology.

Science - ways of description: sociological - psychological - organizational / institutional - historical - methodological.

Classifications of the sciences.

Characteristics of the sciences due to the methods of justification

Division of the sciences into deductive and empirical

Nomothetic vs. idiographic sciences

Empirical Sciences

Inductionism - Hypothetism.

Induction canons

The structure and dynamics of a scientific theory

Elements of the logical theory of science.

Criteria of science and the development of empirical sciences

rules for accepting claims - falsifiability and its variants

Paradigms - their dynamics and role in research

Methodological disputes in social sciences

Positivism - post / noe-positivism - constructionism - interpretativism - postmodernism

Realism - cognitive relativism - other

- naturalism and anti-naturalism in sociological theory.

Sociology in science classification systems.

- Reductionism and anti-reductionism.

- Individualism and Holism - levels of analysis in sociology.

The specificity of engineering sciences and engineering methodology

The specificity of social sciences and methodology of social science

The unity of science and the unity of methodological assumptions

The language of methodological analyzes: the language of research questions and scientific hypotheses, understanding and interpretation

Theorems and theories in social sciences.

Types of theorems.

Classifications and typologies - systematization and taxonomies.

Construction rules - ideal type.

Observational concepts and theoretical concepts

Defining and postulating the operationalization of concepts

definition functions: reporting - designing - regulating.

defining 'minimal' and 'typological-ideal' (minimax)

Indicators and variables - 'representing' theoretical concepts in the study

- introduction to the procedures of 'indicating' (indicators) in sociology

Measurement, the concept of measuring and the basics of scaling hidden features

Types of measurements and types of measurement scales in research

Causality in engineering and social sciences

Practical use of the method of causal analysis in engineering

Explaining and anticipating in engineering sciences.

Logical explanation / prediction patterns

Modeling - formal models

Modeling of engineering phenomena and processes

Application of selected formal theories as models

Teaching methods

Lecture, talk, presentation, project

Bibliography

Basic

1. Apanowicz J. Metodologia ogólna, strona: https://wsaib.pl/images/files/E-Publikacje/MO.pdf

2. Dobosz A. Kazimierza Ajdukiewicza pogląd na rolę wnioskowania redukcyjnego w twórczości naukowej, w: Filo-Sofia 2015, vol. 15, no. 28, s. 73-91.

3. Kotarbiński T. Elementy teorii poznania, logiki formalnej, metodologii nauk, Wrocław 1961

4. Such J., Szcześniak M., Filozofia nauki, Wyd. Naukowe UAM, Poznań 2006

5. Wójcicki R., Metodologia formalna nauk empirycznych. Podstawowe pojęcia i zagadnienia 1974

Additional

Ajdukiewicz K., Zagadnienia i kierunki filozofii., Kęty 2003.

2. Matraszek K. Such,J. Filozofia T.2. Ontologia, teoria poznania i ogólna metodologia nauk 1989 3. Tatarkiewicz W., Historia filozofii, tom I- III Warszawa 2014.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	15	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	35	1,0

[1] delete or add other activities as appropriate