



COURSE DESCRIPTION CARD - SYLLABUS

Course name

TECHNOLOGY OF INDUSTRY 4.0 [S5NOZIJ>TP40]

Course

Proposed by Discipline

–

Year/Semester

2/4

Level of study

Doctoral School

Course offered in

English

Form of study

full-time

Requirements

elective

Number of hours

Lecture

8

Laboratory classes

0

Other

0

Tutorials

0

Projects/seminars

0

Number of credit points

2,00

Coordinators

prof. dr hab. inż. Stefan Trzcieliński
stefan.trzcielinski@put.poznan.pl

Lecturers

prof. dr hab. inż. Stefan Trzcieliński
stefan.trzcielinski@put.poznan.pl

Prerequisites

Knowledge: Functional areas and organizational structure of an industrial enterprise; the cycle from R&D to the production of a product that meets customer expectations; the essence of the supply chain, value chain, and value stream. Skills: Defining the technological phases of a product; selecting machinery and equipment for product production depending on the production scale. Social competencies: effective communication with organizational participants, teamwork, and arguing for one's own opinions.

Course objective

Learning about the repertoire of technologies that constitute Industry 4.0 and how they can be configured within a holistic product development cycle and market launch.

Course-related learning outcomes

Knowledge

A PhD student who graduated from doctoral school knows and understands:

- 1) global achievements, covering theoretical foundations as well as general and selected specific issues that are relevant to scientific disciplines studied at the Doctoral School, to the extent that enables revision of existing paradigms, [P8S_WG/SzD_W01]
- 2) key developmental trends of disciplines of science in which education at the Doctoral School takes place, [P8S_WG/SzD_W02]

3) fundamental dilemmas of the contemporary civilization, [P8S_WK/SzD_W05]

Skills

A PhD student who graduated from doctoral school can:

- 1) use knowledge from different branches of science to creatively identify, formulate and innovatively solve complex problems or to perform research tasks such as:
 - define the aim and subject of scientific research, form a research hypothesis,
 - develop research methods, techniques and tools and use them creatively,
 - draw conclusions on the basis of research results, [P8S_UW/SzD_U01]
- 2) critically analyze and assess scientific research results, work of experts and other creative activities together with their contribution into knowledge development, [P8S_UW/SzD_U02]
- 3) transfer the results of scientific activity to the economic and social sphere, [P8S_UW/SzD_U03]
- 4) communicate on specialist issues on the level that allows active participation in the international scientific community, [P8S_UK/SzD_U04]
- 5) share results of scientific activity also in a popular form, [P8S_UK/SzD_U05]
- 6) take part in scientific discourse, [P8S_UK/SzD_U07]

Social competencies

A PhD student who graduated from doctoral school is ready to:

- 1) critically assess achievements within a given scientific discipline, [P8S_KK/SzD_K01]
- 2) critically evaluate their own contribution to development of a given scientific discipline, [P8S_KK/SzD_K02]
- 3) acknowledge the importance of knowledge in solving cognitive and practical problems, [P8S_KK/SzD_K03]
- 4) think and act in an entrepreneurial manner, [P8S_KO/SzD_K06]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

PQF Code

Learning Outcome Assessment Methods

Assessment Criteria

W01, W02, W05

Conversation during the lecture

- Correctness of answers to questions
- Correctness of examples included in the doctoral student's statement

U01, U02, U03, U04, U05, U07

Completing the task during the lecture

Completing the final project

- Proposal for the application of Industry 4.0 technologies in a doctoral student's professional work
- Product selection and definition of Industry 4.0 technologies in the cycle of product development and launching it to the market

K01, K02, K03, K06

Team Based Working

Completing the final paper

- Applying a system thinking to configuration of Industry 4.0 Technologies

Programme content

1. Introduction to Industry 4.0.
2. The cycle of Product Development and launching to the market – Technical, Marketing, and Economic Aspects.
3. Introduction to Production and Control Management.

Course topics

1. Industry 4.0 - The Essence.

2. Technologies supporting: Product Development, Product Engineering.
3. Technologies supporting: Manufacturing Management, Production Management, Production Control.
4. Technologies supporting Supply Chain Management.
5. Industry 4.0 vs. Industry 5.0.

Teaching methods

Lecture:

multimedia presentation including illustrations and examples.

Bibliography

Aniceski, T.A., Canciglieri, A.B., Canciglieri Junior, O., Nara, E.O.B. & Benitez, G.B. (2026). "New product development in the Industry 4.0 era: a literature review and research agenda". *Production Planning & Control*, 37(6), 619–643. DOI: 10.1080/09537287.2025.2570209.

Gilchrist, A. (2016). *Industry 4.0: The Industrial Internet of Things*. Berkeley, CA: Apress. ISBN 978-1-4842-2046-7; eISBN 978-1-4842-2047-4. DOI: 10.1007/978-1-4842-2047-4. 250 pp.

Trzcielinski S. (2023). Human Intelligence vs. Artificial Intelligence in Opportunity Discovery. In: Waldemar Karwowski and Stefan Trzcielinski (eds) *Human Aspects of Advanced Manufacturing*. AHFE (2023) International Conference. AHFE Open Access, vol 80. AHFE International, USA.
<http://doi.org/10.54941/ahfe1003512>

Trzcieliński S., Kruszyński M., Trzcielińska J. (2023). Shaping the enterprise's strategy – theory and practice / Kształtowanie strategii przedsiębiorstwa – teoria i praktyka. Wydawnictwo Politechniki Poznańskiej (open access).

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	8	0,00
Doctoral student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation)	42	2,00