

## SYLLABUS

**Name:** Introduction to Industry 4.0

**Name in Polish:** Wprowadzenie do Przemysłu 4.0.

**Name in English:** Introduction to Industry 4.0

### Information on course:

**Course offered by department:** Faculty of Organisation and Management  
**Course for department:** Silesian University of Technology  
**Study level and form:** Bachelor's degree, Full-time  
**Term:** summer semester 2023/2024  
**Coordinator of course edition:** prof. PhD DSc, University Professor Małgorzata Dobrowolska

### Default type of course examination report:

Credit for (grade allocation)

### Language:

English

### Course homepage:

<https://platforma.polsl.pl/roz/>

### ECTS

5

### Short description:

The lecture is conducted in an interactive manner, involving students in activities during the course of the lecture, including discussion, sharing opinions and experiences. The lecture is based on the Harvard Business School paradigm with the use of mini-case studies and micro presentations by students in the framework of so-called participatory teaching. During the lecture, special guests are invited from the socio-economic environment, entrepreneurs, who are an experts in a given issue/module of the lecture topic.

#### *Course assumptions:*

A presentation of issues related to the widely understood new technologies described in connection with the fourth industrial revolution, recently introduced into business practice under the banner of the new economy, also described as digital transformation. These issues are relevant to virtually all businesses, which first decide to introduce technological and organisational changes resulting from technological and social advances.

To acquire the ability to recognise and analyse the actions of business actors, consumers and the regulator in the digital economy. The primary objectives of the course are also to impart selected knowledge from the economic sciences about an economy that is increasingly taking on the characteristics of digital economy 4. 0, including analogue processes of production, exchange and consumption in the real world and digital processes in the virtual world; a significant part of this knowledge relates to changes in the behaviour of producers and distributors who, using digital technologies, introduce innovative business models, as well as the behaviour of consumers, who increasingly enjoy access to goods without acquiring them on their own and, in many situations, consciously or unconsciously provide the providers of goods, including services, with data on their own behaviour, and the behaviour of regulators striving to establish a publicly desired economic order.

In addition, shaping the ability to record and analyse events that in the digital economy comprise analogue and virtual processes realised on a microeconomic scale with human participation and by automatic systems, including those using solutions of narrow artificial intelligence, as well as to record and analyse these processes on a macroeconomic scale; classes include own work with computer hardware and software and smartphone software, these are innovative professional solutions used in economic practice. Shaping the competence to express one's own view on the importance of the development of the digital economy, as well as the competence to participate in the management process of economic and other entities participating in this economy.

Familiarisation with all the technological pillars of Industry 4.0.

### Description:

Lecture:

1. The road to Industry 4.0 - the evolution of principles and methods
2. Components of Industry 4.0
3. Strategic challenges of Industry 4.0
4. Business models for Industry 4.0
5. New technologies and 4.0 solutions for manufacturing and supply chain - examples of implementation
6. Relationship between Industry 4.0 and the concepts and challenges of today's world

7. Industry 4.0 and social aspects of technology introduction
8. Examples of employee adaptation programmes for 4.0 technology implementation.
9. Importance of 4.0 competencies and mental levels for technology implementation and development in the organisation
10. Organic and inorganic team management

#### Exercises/Project activities

1. Presentation of the technological pillars of Industry 4.0.
2. Development of implementation scenarios for selected technologies
  - a) Incremental technologies
  - b) Cyber security, MDM systems, Firewalls
  - c) Autonomous robots
  - d) Augmented reality
  - e) Big data processing, cloud computing
  - f) Simulations and process visualisations
  - g) System integration
  - h) Industrial Internet of Things
3. Business models for Industry 4.0.
4. Technology and product assessment
5. Implementation project of Industry 4.0 technology in a selected organisation

Number of hours of classes with direct participation of an academic teacher: 45

Lecture: 15 hours

Exercises: 30 hours

Number of hours allocated to student's own work:

- Preparation for lecture: 20h
- Preparation for exercises: 30h
- Completion of descriptive work - so called post-work: 15h
- Execution of a chosen form from those described for optional credit: 15h

Total number of hours: 125

Number of ECTS credits: 5

Number of ECTS credits obtained through direct teaching activities: 2

#### **Bibliography:**

##### *Literatura podstawowa:*

Cyfryzacja gospodarki i społeczeństwa. Szanse i wyzwania dla sektorów infrastrukturalnych pod redakcją naukową Jerzego Gajewskiego, Wojciecha Paprockiego i Jany Pieriegud, Publikacja Europejskiego Kongresu Finansowego, Gdańsk 2016.

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Stawiarska, E., Szwałca, D., Matusek, M., Wolniak, R., 2020, Wdrażanie rozwiązań Przemysłu 4.0, CeDeWu

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wielkopolskie?; <https://wrot.umww.pl/wpcontent/uploads/2019/10/Przemys%C5%82-4.0.pdf>

Simens, 2019, Od przemysłu 4.0 do smart factory, <https://publikacje.siemens-info.com/pdf/76/Od%20Przemys%C5%82-4.0%20do%20Smart%20Factory.pdf>

##### *Literatura uzupełniająca:*

J. Surma, Cyfryzacja życia w erze Big Data. Człowiek-Biznes-Państwo, Wydawnictwo Naukowe PWN, Warszawa 2017.

E.Schmidt, J.Cohen, The New Digital Age. Reshaping the Future of People, Nations and Business, John Murray Publishers, London 2013.

W. Paprocki, Role of Virtual Platform Operators in Transforming Consumer Goods Market, ?Journal of Management and Financial Sciences? Volume XI, Issue 27 (March 2017), p. 25-37.

Nowicka, N., Szymczak, M., 2020, Logistyka i łańcuchy dostaw w obliczu czwartej rewolucji przemysłowej, Studia BAS, 3(63), 61-84  
 Misztal, J., Sosnowska, E., Stasiak, T., Wojciechowski, P., 2020, Usługi logistyczne w przedsiębiorstwach 4.0, Przedsiębiorczość i Zarządzanie, 23-24  
 Bulak, K., 2019, Ocena możliwości implementacji Przemysłu 4.0 w polskich przedsiębiorstwach produkcyjnych, Academy of Management, 3(2), 78-86  
 Łobaziewicz, M., Zarządzanie inteligentnym przedsiębiorstwem w dobie przemysłu 4.0, Tonik, Toruń

#### Learning outcomes:

symbol	expected learning outcomes <i>a student who has passed the course:</i>	forms of instruction	ways of verifying and assessing the learning outcome
Knowledge: knows and understands			
K1A_W3	Basic engineering processes and technologies in the life cycle of technical equipment, objects and systems and ways of solving typical engineering tasks, particularly in relation to the organization of production processes and production management.	Lecture / exercises	1. Attendance 2. Oral test - activity 3. Written assessment
K1A_W7	Fundamental problems of contemporary civilization relevant to the production engineering.	Lecture / exercises	1. Attendance 2. Oral test - activity 3. Written assessment
Skills: is able to			
K1A_U5	Make a critical analysis of the functioning of existing technical and technological solutions in production systems function, evaluate these solutions and suggest appropriate improvements and innovations in this regard.	Lecture / exercises	1. Attendance 2. Oral test - activity 3. Written assessment
K1A_U8	Solve practical engineering tasks taking into account engineering standards and norms and applying specific technologies appropriate to production engineering, using experience gained in a professional engineering environment.	Lecture / exercises	1. Attendance 2. Oral test - activity 3. Written assessment
Social competence: is prepared to			
K1A_K3	Responsible performance of professional roles, compliance with the rules of professional ethics and requiring it from others, care for the achievements and traditions of the profession; is aware of the importance and understands non-technical aspects and effects of engineering activities.	Lecture / exercises	1. Attendance 2. Oral test - activity 3. Written assessment

#### Assessment methods and assessment criteria:

Compulsory course credit requirements:

- Attendance:

1 absence is permissible, any additional absences should be excused and made up as they go along, in the form of an oral presentation of problem issues from the course in which the student was absent - after an appointment with the lecturer at a teaching consultation.

*- Oral test - activity:*

Activity in class, participation in discussion, substantive preparation for class (the sum of pluses makes up the activity grade). Students may receive 1 or 2 pluses in each class, depending on his/her level of engagement and presentation of self-preparation for the class. The pluses will be recorded on an ongoing basis and, at the end of the semester, the sum of the pluses will determine the marks for the oral test.

Grading criteria:

14 pluses and above = grade 5.0

13 - 11 pluses = grade 4.5

10 - 8 pluses = grade 4.0

7 - 5 pluses = grade 3.5 min. 4

pluses = grade 3.0

*- Knowledge check - an original written thematic paper, so-called post-work, on a topic chosen by the student.*

The following criteria will be taken into account in the assessment process:

Correct and substantive definition of the post-work topic; Relevance of the topic to the activities, assignments and case studies carried out in class; Correctly formulated general and specific objectives; Thematic scope and exhaustive description of the topic; Bibliographic resource and sources; Resourcefulness of the appendices.

For each criterion met, the student can obtain 1 or 2 points, so the maximum number of points to be obtained is 28.

Assessment is carried out according to the post-work written topic paper assessment scale.

Assessment criteria:

26 – 28 points = grade 5.0

23 – 25 points = grade 4.5

20 – 22 points = grade 4.0

17 – 19 points = grade 3.5

14 - 16 points = grade 3.0

min. 14 points = credit

*- Micro-teaching - self-directed delivery of a talk on a lecture topic module together with a presentation of own opinion and thoughts on the topic.*

Student may obtain 1 or 2 points for each criterion met, so the maximum number of points to be obtained is 22.

The assessment is done according to the microlearning assessment scale.

Assessment criteria:

21 – 22 points = grade 5.0

19 – 20 points = grade 4.5

16 – 18 points = grade 4.0

14 – 15 points = grade 3.5

11 – 13 points = grade 3.0 min.

11 points = credit

Microteaching time: up to 5 minutes per speech.

Additional course credit requirements (optional):

*- Multimedia presentation - substantive preparation of the thematic module. Multimedia presentation with a selected theoretical topic on the introduction to the ongoing microteaching activities. Duration up to 7 minutes.*

Assessment criteria:

5 points = very good presentation in terms of content and methodology, creative presentation, high involvement of the student in the preparation of the presentation; grade 5.0

4 points = good presentation in terms of content and methodology, creative presentation, average student involvement in preparation of presentation; grade a 4.0

3 points = sufficient presentation in terms of content and methodology, not very creative presentation, low involvement of the student in the preparation of the presentation; grade 3.0

2 points and less = Inadequate presentation in terms of content and methodology, lack of creativity in the presentation, very low or no involvement of the student in the preparation of the presentation; grade 2.0 (presentation not passed, requiring written correction).

- *Written case study* - testing the ability to apply knowledge in practice.

Written test: Written project - presentation of a case study chosen by the student concerning the thematic module of the lecture.

Assessment criteria:

5 points = very good case study in terms of content and methodology, relevant to the lecture topic module, high student involvement in the preparation of the case study; grade 5.0

4 points = Good case study in terms of content and methodology, adequate for the lecture topic module, average student involvement in case study preparation; grade 4.0

3 points = Sufficient case study in terms of content and methodology, not very relevant to the lecture topic module, low student involvement in the preparation of the case study; grade 3.0

2 points and less = Inadequate case study in terms of content and methodology, inadequate for the lecture topic module, very low or no student involvement in the preparation of the case study; grade 2.0 (Written case study not passed, requiring written correction).

- *Written exam consisting of 5 essay questions.*

Assessment criteria:

5 points = providing correct answers to five essay questions in a comprehensive and factually correct manner; grade 5.0

4 points = providing correct answers to the four essay questions in a comprehensive and factually correct manner; grade 4.0

3 points = provide correct answers to the three essay questions in a comprehensive and factually correct manner; grade 3.0

2 points and less = providing correct answers to two or fewer descriptive questions; grade 2.0, written exam not passed, requiring written improvement.

Course grades will be determined individually with the Student in consultation, taking into account the following components:

- *attendance*, class activity, microteaching - self-directed contributions to the lecture topic module with presentation of own opinion and thoughts on the topic.
- *knowledge check* - *an original written post-work* on a topic chosen by the student.

and additional, optionally selected from:

- multimedia presentation - theory
- written case study
- and the result of the written examination

Will therefore be the average of the component grades obtained, enhanced by the Student's self-assessment.

**Practical placement:**

Not applicable