SYLLABUS

Name: Industry 4.0 technologies (PBL)
Name in Polish: Technologie Przemysłu 4.0.
Name in English: Industry 4.0 technologies (PBL)

Information on course:

Course offered by department:	Faculty of Organisation and Management
Course for department:	Silesian University of Technology
Study level and form:	Master 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

6

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: 60
Lecture: 30 hours
Exercises: 30 hours (15 project, 15 laboratory)

Number of hours allocated to student's own work:
- Preparation for lecture: 30h
- 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: 150
Number of ECTS credits: 6

Number of ECTS credits obtained through direct teaching activities: 6

Bibliography:

Literatura podstawowa:
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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

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Learning outcomes:

symbol	expected learning outcomes *a student who has passed the course:*	forms of instruction	ways of verifying and assessing the learning outcome
Knowledge: knows and understands			
K1A _W10	Selected issues in the field of advanced detailed knowledge typical of the field of study of management and production engineering.	Lecture / exercises	*1. Attendance* *2. Oral test - activity* *3. Written assessment*
K1A _W1	At an in-depth level - selected facts, objects and phenomena, as well as methods, theories and conditions explaining the complex relationships between them and constituting advanced general knowledge in the field of mechanical engineering in connection with other fields.	Lecture / exercises	*1. Attendance* *2. Oral test - activity* *3. Written assessment*
Skills: is able to			
K1A _U01	Use the acquired knowledge - formulate and solve complex and unusual problems and innovatively perform tasks in unpredictable conditions by: -proper selection of sources and information derived from them; evaluation of the information, its critical analysis, synthesis, creative interpretation and presentation, -selection and use of adequate methods and tools, including advanced ICT techniques, -adapting existing or developing new methods and tools.	Lecture / exercises	*1. Attendance* *2. Oral test - activity* *3. Written assessment*
K1A _U03	When identifying and formulating specifications for engineering tasks and solving them: -use analytical, simulation and experimental methods, -see their systemic and non-technical aspects, including ethical issues, -make a preliminary economic assessment of proposed solutions and undertaken engineering activities.	Lecture / exercises	*1. Attendance* *2. Oral test - activity* *3. Written assessment*
K1A _U14	Lead the work of a team, interact with others as part of teamwork and take the role of the team leader.	Lecture / exercises	*1. Attendance* *2. Oral test - activity* *3. Written assessment*
Social competence: is prepared to			
K1A _K01	Critical evaluation of the acquired knowledge and received content.	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