COURSE DESCRIPTION CARD - SYLLABUS

Course name
Sustainability [S2ZiIP2>ZR]

Course

Field of study
Management and Production Engineering

Year/Semester
2/3

Area of study (specialization)
Quality Engineering and Management

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
15

Number of credit points

4,00

Coordinators

dr inż. Marta Grabowska
marta.grabowska@put.poznan.pl

Lecturers

Prerequisites

The student has basic knowledge of manufacturing processes carried out in manufacturing companies. The student also mastered basic issues related to business management. He sees the possibility of continuous improvement of various aspects of the organization's functioning. Is able to interpret the requirements of standards regarding management systems. Students should have knowledge of the systems design and management process, including requirements identification, analysis, modeling, integration, implementation and optimization. When taking this course, a student should demonstrate knowledge of mathematics and economics.

Course objective

Showing engineering activity in a broader context of human activity and progress, teaching creative thinking and conceptual design of products and services (systems). The aim of the subject is to develop skills in designing, managing and optimizing production systems, taking into account aspects of sustainable development, such as energy efficiency, minimizing environmental impact and corporate social responsibility.

Course-related learning outcomes

Knowledge:
Has structured, theoretically based knowledge of trends in improving the organization of control and supervision of production processes
Has general knowledge of the holistic approach and sustainable development
Has detailed knowledge of the life cycle of devices, facilities and technical systems

Skills:
Is able to develop forecasts regarding the effectiveness and efficiency of production processes
Is able to plan and carry out design work related to the organization of the production system
Is able to carry out a risk analysis of the production system, its processes and the equipment used

Social competences:
Is aware of the need to critically analyze and evaluate their proposals and actions
Is aware of the effects of engineering activities in both technical and non-technical areas.
Is aware of the consequences of decisions made and responsibility for decisions made.
Has the knowledge necessary to understand the social, economic, legal and other non-technical conditions of engineering activities

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Assessment based on a colloquium consisting of 15÷20 test questions carried out at the end of the semester. Passing from 51% of points obtained.
Exercise: Passed based on the results of work during classes: tasks, discussions, workshops.
Projects: assessment based on project development - team work.
Assignment of grades to percentage ranges of results: <90–100> very good; <80–90) good plus; <70–80) good; <60–70) satisfactory plus; <50–60) satisfactory; <0–50) unsatisfactory.

Programme content

Basic concepts and definitions regarding: systems theory, systems engineering; system reliability; models of system behavior.
Introduction to Sustainability; economics of sustainable development; shaping sustainable development initiatives.

Course topics

Lecture: basic concepts and definitions regarding: systems theory, systems engineering, systems analysis, structural and cybernetic definition of the system, system state and stability, types of system structures, process as a system, etc. System reliability, mathematical modeling of the system, structural models of the system, functional analysis system, system decomposition.
Simple models of systems behavior: market equilibrium, production model, competition for resources, arms race, urbanization, wear and tear of machines and technical systems. Identification, evolution and prediction of systems behavior. Differential equations in systems modeling. Artificial neural networks, system model as a "black box". System method. The rigors of the systemic method. Systems engineering.
Introduction to sustainable development, European Green Deal, Ecology and environment, Corporate social responsibility, Sustainable economy, Economics of sustainable development and modeling of resource systems - circular economy, Design and implementation of sustainable development initiatives
Exercises: creating sustainable development projects and strategies, cost-benefit analysis, environmental impact assessment.
Project: development of a full system analysis process for a selected issue, selection of topic in consultation with the instructor.

Teaching methods

Lecture: multimedia presentation illustrated with examples given on the blackboard. Lecture conducted remotely using the synchronous access method.
Exercises and Project: case studies, computer simulations, group projects, real data analysis, discussions and presentations to enable students to practically apply theoretical knowledge and develop skills related to systems engineering and sustainability.

Bibliography

Basic:
1. Hamrol A., Quality management with examples, PWN Warszawa, 2012
2. Kamiński R., Sustainable development of enterprises as a subject of non-financial reporting, PWE, 2014
3. Hadryjańska B., The road to sustainable development in Poland in the light of the assumptions of the 2030 Agenda, Difin Warszawa, 2021
4. Pieśniak M. Selected aspects of sustainable development and quality of life, Wydawnictwo Naukowe Sophia 2016
5. Blanchard B.S., Fabrycky W.J., Systems Engineering and Analysis, Prentice Hall, New Jersey, 1990
6. Cempel C., Theory and engineering of systems - principles and applications of systems thinking, Wydawnictwo Instytut Technologii Eksploatacji, Radom 2006.
7. Robertson J. and S., Full system analysis of WNT, Warsaw, 1999

Additional:
1. PN-EN ISO 9001:2015 Quality Management Systems. Requirements
2. PN-EN ISO 14001:2015 Environmental Management Systems. Requirements

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	47	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	53	2,00