COURSE DESCRIPTION CARD - SYLLABUS

Course name
Integrated design [N2Trans1>PZ]

Course

Field of study
Transport

Year/Semester
1/1

Area of study (specialization)
Railway Transport

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
9

Laboratory classes
0

Other
0

Tutorials
9

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

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Prerequisites

Basic knowledge of techniques and design processes. Skills of logical and systemic thinking, work organization, using information obtained from the library, the Internet, standards and catalogs. Ability to transfer the acquired knowledge, basics of teamwork skills

Course objective

Gaining basic knowledge on various models and methods of integrated design, taking into account the issues of concurrent engineering and optimization in terms of technical, economic, safety and environmental criteria

Course-related learning outcomes

Knowledge:
Student has advanced and detailed knowledge of the processes taking place in the life cycle of transport systems

Student knows advanced methods, techniques and tools used in solving complex engineering tasks and conducting research in a selected area of transport

Skills:
Student is able to make a critical analysis of existing technical solutions and propose their improvements
Student is able to solve complex tasks in the field of transport engineering, including atypical tasks and tasks with a research component, using, among others conceptually new methods
In accordance with a given specification, taking into account non-technical aspects, Student is able to design a complex device, system in the field of transport engineering or a process and implement this project (at least in part) using appropriate methods, techniques and tools, including adapting the existing or developing new tools

Social competences:
Student understands that knowledge and skills become obsolete very quickly in the field of transport engineering

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Lecture - written test
Classes - written test and test based in the own studies of the planned project

Programme content

Elements and methods of integrated design
Strategies and methodology of concurrent engineering
Organizational and process aspects of concurrent engineering
Elements of design and construction methodology
Activities of the working team in solving problems
The importance of system theory of technology for design
Human-device social engineering system
Principles and conditions of designing mechatronic systems
Principles of life cycle management
Design models and examples of their applications in the field of transport systems
Principles of systems optimization
Design for X concept
Principles of integrated security
Development and construction of multi-variant products
Cost-oriented design

Course topics

Evolution of approaches to product design. Principles, elements, and methods of integration within the design process, including human, information technology, and organizational integration. Interrelationships between design time, cost, and quality. Definitions and strategies of integrated design. Comparison of traditional and integrated approaches to the design process.
Key areas of concurrent engineering, including organization, processes, resources, and product development. Fundamentals of design and engineering design methodologies. Psychological aspects of creative problem solving, including common difficulties, limitations, and errors encountered in the problem-solving process. Types of memory and modes of thinking.
Fundamentals of the systems theory of technology, with examples of subsystems within action systems. Substitution and complementation in human - technical system interactions. Types and classifications of systems. Operations, actions, and means within technical systems.
Key aspects of integrated design illustrated by selected examples of mechatronic systems. Life cycle thinking in integrated product design, with a focus on selected products and their life-cycle considerations. General characteristics of the design process, types of design problems, and selected design models. Principles of system optimization and examples of their application to the design of technical systems and products. The Design for X family of methods. Ecodesign and life cycle management.

Teaching methods

Lectures - presentations of issues and discussion on them
Classes - presentations of methods used in integrated design and examples of their applications as well as workshops on projects developed by students

Bibliography

Basic
1. Branowski B .: Methods of creative solving of engineering problems, Greater Poland Technical Corporation NOT, Poznań, 1999
2. Dietrych J .: System and structure, WNT, Warsaw, 1978
3. Ed. Kurczewski P., Lewandowska A., Principles of pro-environmental design of technical objects for the purposes of managing their life cycle, KMB Druk, Poznań 2008
Additional
1. Gawrysiak M.: System analysis of a mechatronic device, Białystok University of Technology, Białystok, 2003
2. Radkowski S .: Fundamentals of safe technology, Publishing House of the Warsaw University of Technology, Warsaw, 2003
3. Ullman D., G .: The Mechanical Design Process, Mc Graw Hill, New York, 2003

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,00
Classes requiring direct contact with the teacher	18	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	42	1,00