COURSE DESCRIPTION CARD - SYLLABUS

Course name
Product Ergonomics [S1IZarz1>EProd]

Course

Field of study
Engineering Management

Year/Semester
2/4

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
0

Other (e.g. online)
0

Tutorials
15

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

The student has basic knowledge in the field of ergonomics

Course objective

The aim of the course is to provide practical skills in the ergonomic and design of products - better consideration of human needs in design solutions

Course-related learning outcomes

Knowledge:
The student defines product ergonomics, explaining ergonomic evaluation criteria and its impact on the life cycle of industrial products [P6S_WG_15].
The student identifies methods, techniques, tools, and materials used in ergonomic design, including aspects of safety and occupational hygiene [P6S_WG_16].
The student characterizes industrial technologies used in ergonomic design [P6S_WG_17].
The student describes non-technical conditions of engineering activities, considering the impact of product ergonomics on the work environment [P6S_WG_18].

Skills:
The student applies analytical, simulation, and experimental methods in ergonomic design, including in the analysis of requirements and morphological analysis [P6S_UW_10].
The student integrates systemic, socio-technical, organizational, and economic aspects in the process of ergonomic design [P6S_UW_11].
The student conducts an economic analysis in ergonomic design, using methods such as ergonomic TRIZ [P6S_UW_12].
The student identifies and designs ergonomic solutions, considering user comfort and product safety [P6S_UW_14].

Social competences:
The student integrates technical, economic, marketing, legal, organizational, and financial requirements in the process of creating ergonomic products [P6S_KO_02].
The student considers responsibility for ergonomic aspects of products and their significance for users and the environment [P6S_KR_01].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Formative assessment:
a) exercises: current assessment (on a scale of 2 to 5 points) of tasks ordered,
b) lectures: answers to questions about the material discussed in previous lectures.
Summative rating:
a) exercises: the final grade is the average of partial tasks; exercises passed after obtaining at least average 3.0,
b) lectures: written colloquium from the content presented in the lecture (form: open and problem questions)

Programme content

Product concept and product ergonomics. Criteria for assessing the product, including the industrial product. Ergonomic design. Laws and standards in ergonomic design. The tasks of product ergonomics: adapting technical objects to human dimensions and shapes, ensuring the functionality of a technical object (e.g. efficiency, suitability of form, function, reliability, susceptibility to repair regulations, ease of disposal after use), ensuring safety and comfort of using a technical object, eliminating negative the impact of the product on human environmental conditions, care for the aesthetics and colors of the technical object. Benefits of product ergonomics. Losses resulting from low ergonomics of technical facilities. Test methods and assessment of product ergonomics. Industrial ergonomics and design. Exercises: the use of analyzes that allow achieving better ergonomic quality of the product, analysis of requirements, morphological analysis, home of quality for the purposes of an ergonomic product, ergonomic TRIZ.

Course topics

- Ergonomics definitions: Understanding basic terms and definitions related to ergonomics.
- Problem formulation: Identifying and defining ergonomic problems in product design.
- Design problem analysis: Methods for analysing ergonomic problems in the context of product design.
- Ergonomics standards in workstation design: Ergonomic requirements and standards in workplace design.
- Human error: Analysis of human error and its impact on ergonomic design.
- Praxeology and deed theory: Application of deed theory in the optimisation of ergonomic processes.
- How to speed up the experience: Methods for increasing the efficiency of the user experience through ergonomic design.
- Problem assessment according to PN-ISO 6385: Standards and procedures for the assessment of ergonomic problems.
- Injury-related costs: Analysis of the costs of injuries resulting from non-ergonomic design.
- Physiological, functional and subjective measures: Different methods for measuring ergonomic load on users.
- Assessment methods (NASA TLX): Application of the NASA TLX method to assess workload.
- Factors affecting work stress: Identification and analysis of stressors associated with non-ergonomic design.

- Human error: The role of human error in ergonomic product design.
- Human reliability analysis: Methods for analysing and assessing human reliability in the context of ergonomics.
- Human Factors Engineering: Application of human factors engineering in the design of ergonomic products.
- Human factors training: The importance of training in improving ergonomics in design.
- Dynamic Task Allocation (DTA): Optimising task allocation in the context of ergonomics.
- Technical, organisational and human factors: Interactions between technology, organisation and ergonomics in design.
- Data acquisition: Data collection methods for ergonomic analysis.
- Assessment tools: Tools and techniques for assessing the ergonomics of products.
- Observational methods and interviews: Application of observational methods and interviews in ergonomic research.
- Ethnographic procedures: The use of ethnography in ergonomics research.
- Value of ethnographic research: The importance of ethnographic research for ergonomics improvement.
- The SCAMPER method: Creative techniques for improving product ergonomics.
- Quality Function Deployment (QFD): The QFD method in the context of ergonomic quality assurance.
- Morphological Analysis: Application of morphological analysis in the design of ergonomic products.
- Persuasion and User Motivation: Techniques for motivating users through ergonomic design.
- Barriers and triggers: Identification of barriers and triggers in the context of ergonomics.
- Human needs (H. Murray vs Maslow): Application of needs theory to ergonomic product design.
- Principles of persuasion (Cialdini): Using the principles of persuasion to improve ergonomics.
- Conditioning (Pavlov): Application of conditioning techniques in the design of ergonomic products.
- Persuasive design techniques: Design techniques to influence user behaviour in the context of ergonomics.
- Universal design principles: Design principles for all users, regardless of ability.
- Practical approaches to universal design: Examples and techniques of universal design.
- Gerontechnology: The use of technology in designing for older users.
- Principles of universal design for the disabled: Product adaptations for people with disabilities.
- Examples of adaptations of products and environments for people with disabilities: Specific examples of product adaptations.
- Definitions of interaction design: Understanding the basics of user-product interaction design.
- Good and bad design: Analysis of examples of good and bad design in the context of ergonomics.
- Interaction design objectives: Main objectives of interaction design with ergonomics in mind.
- User-centred design methods: User-centred design techniques.
- User interfaces and user experience (UX): Designing interfaces with ergonomics in mind.
- Interdisciplinary approaches in interaction design: The role of different disciplines in ergonomic interaction design.
- Observation coding: Techniques for coding observational data in ergonomic research.
- Types of questions in interviews: Types of questions used in ergonomic interviews.
- Questioner behaviour in interviews: The role of interviewer behaviour in ergonomic research.
- Social anthropology: The use of social anthropology in ergonomics research.

Teaching methods

Teaching methods:
Conversational lecture
exercises:
The classic problem method
Case method
The staging method
Idea exchange (brainstorming)

Bibliography

Basic:
Jabłoński J. (red.), Ergonomia produktu. Ergonomiczne zasady projektowania produktów, Wyd. Politechniki Poznańskiej, Poznań, 2006
Butlewski M., Projektowanie i ocena wyrobów. - Poznań: Wydaw. Politechniki Poznańskiej , 2013. - 106 s.

Butlewski M., Heuristic Methods Aiding Ergonomic Design, Universal Access in Human-Computer Interaction. Design Methods, Tools, and Interaction Techniques for eInclusion, Lecture Notes in Computer Science Volume 8009, 2013, pp 13-20
Butlewski M., The issue of product safety in contemporary design. in: Safety of the system, Technical, organizational and human work safety determinants. Red. Szymon Salamon. Wyd. PCzęst. Częstochowa 2012. ISBN 978-83-63500-13-9, ISSN 1428-1600, pp. 112-120
Tytyk E., Projektowanie ergonomiczne, Wydawnictwo Naukowe PWN, Warszawa, 2001
Butlewski M., Projektowanie ergonomiczne wobec dynamiki deficytu zasobów ludzkich / Marcin Butlewski (WIZ) / red. Krystyna Bubacz - Poznań, Polska : Wydawnictwo Politechniki Poznańskiej, 2018 - 255 s.

Additional:
Butlewski M., Tytyk E., Inżynieria ergonomiczna dla aktywizacji osób starszych, Praca i Zabezpieczenie Społeczne, 50 - 59
Butlewski, M., Jasiulewicz-Kaczmarek, M., Misztal, A., Sławińska, M., Design methods of reducing human error in practice, (2015) Safety and Reliability: Methodology and Applications - Proceedings of the European Safety and Reliability Conference, ESREL 2014, pp. 1101-1106.
Norman, D. (2013). The design of everyday things: Revised and expanded edition. Basic Books (AZ).
Norman, D. A. (2004). Emotional design: Why we love (or hate) everyday things. Basic Civitas Books.
Królak, P., & Butlewski, M. (2016). Application of the TRIZ method in design oriented to the various needs of people with disabilities. Occupational Safety and Hygiene IV, 275

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00