COURSE DESCRIPTION CARD - SYLLABUS

Course name
Ergonomics-oriented Design [S1IZarz1E>PE]

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
English

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 and management

Course objective

The aim of the lectures is to familiarize students with the basic issues of the methodology of human-oriented design as an operator and as a service worker of machines and other technical devices. The purpose of the exercises is to convey the skills of designing human - technical object systems during practical design work on specific, detailed design tasks, defined from an anthropocentric point of view.

Course-related learning outcomes

Knowledge:
The student describes the paradigm of ergonomic design, including the human-technical object system and the ergonomic design process [P6S_WG_13].
The student lists and explains decision criteria used in the ergonomic design process, in the context of the industrial product life cycle [P6S_WG_15].
The student identifies methods, techniques, tools, and materials used in ergonomic design, considering the technology of construction and operation of machines [P6S_WG_16].

The student characterizes non-technical conditions of engineering activities, including principles of safety and occupational hygiene [P6S_WG_18].

Skills:
The student applies analytical, simulation, and experimental methods to formulate and solve design tasks in the field of ergonomics [P6S_UW_10].
The student analyzes engineering tasks in terms of systemic, socio-technical, organizational, and economic aspects [P6S_UW_11].
The student conducts a preliminary economic analysis of the designed ergonomic solutions [P6S_UW_12].
The student identifies and solves design tasks related to ergonomics, designing workspace and information-control processes [P6S_UW_14].
The student applies methods for solving problems in ergonomic design, including in the context of designing for people with disabilities [P6S_UW_15].

Social competences:
The student is aware of the importance of a systemic approach in ergonomic design, considering the diverse requirements of users and the socio-economic context [P6S_KO_02].
The student explains and considers non-technical aspects of engineering activities, including the impact of ergonomic design on the environment and society [P6S_KR_01].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Forming assessment: lectures: Written exam (test), at least 55% of correct answers required.
Exercises: Credit for the grade on the basis of: active participation in classes and the implementation of individual tasks
Summative rating issued from the whole

Programme content

The origin of design science and definitions. Designing system and design system. Engineering design: goals, tasks, process structure. The ergonomic design paradigm. The human-technical system as an object of design, decision criteria, structure of the ergonomic design process. Designing: work process, work space, information and control processes, sources of work environment factors - practical examples. Economic and social advantages of ergonomic design. Computer and heuristic design support. Design for disabled people.

Course topics

Understanding of basic terms and definitions related to ergonomics.
Identifying and defining ergonomic problems in product design.
Methods of analysing ergonomic problems in the context of product design.
Ergonomic requirements and standards in workplace design.
Analysis of human error and its impact on ergonomic design.
Application of deed theory in optimising ergonomic processes.
Methods for increasing the effectiveness of user experience through ergonomic design.
Standards and procedures for assessing ergonomic problems according to PN-ISO 6385.
Cost analysis of injuries resulting from non-ergonomic design.
Different methods of measuring ergonomic load on users.
Application of the NASA TLX method for workload assessment.
Identification and analysis of stressors associated with non-ergonomic design.
The role of human error in ergonomic product design.
Methods for analysing and assessing human reliability in the context of ergonomics.
Application of human factors engineering in the design of ergonomic products.
The importance of training in improving ergonomics in design.
Optimisation of task allocation in the context of ergonomics (Dynamic Task Allocation, DTA).
Interactions between technology, organisation and ergonomics in design.
Data collection methods for ergonomic analysis.
Tools and techniques for assessing the ergonomics of products.

Use of observational and interview methods in ergonomic research.
Use of ethnography in ergonomics research.
Importance of ethnographic research for ergonomics improvement.
Creative techniques for improving product ergonomics (SCAMPER method).
The QFD method in the context of ergonomic quality assurance.
Application of morphological analysis in the design of ergonomic products.
Techniques for motivating users through ergonomic design.
Identification of barriers and triggers in the context of ergonomics.
Application of needs theory in ergonomic product design (H. Murray vs Maslow).
Use of persuasion principles in improving ergonomics (Cialdini).
The use of conditioning techniques in the design of ergonomic products (Pavlov).
Design techniques to influence user behaviour in the context of ergonomics.
Design principles for all users, regardless of ability (Universal Design Principles).
Examples and techniques of universal design.
Application of technology in designing for older users (Gerontechnology).
Adaptations of products for people with disabilities.
Specific examples of adapting products and environments for people with disabilities.
Understanding the basics of user-product interaction design.
Analysis of examples of good and bad design in the context of ergonomics.
Main objectives of interaction design with ergonomics in mind.
User-centred design techniques.
Designing interfaces with ergonomics (UX) in mind.
The role of different disciplines in ergonomic interaction design (Interdisciplinary approach).
Techniques for coding observational data in ergonomic research.
Types of questions used in ergonomic interviews.
The role of interviewer behaviour in ergonomic research.
The use of social anthropology in ergonomics research.

Teaching methods

Teaching methods: Conversational lecture
Exercises: Classical problem method, Didactic games,

Bibliography

Basic:
Projektowanie ergonomiczne (Ergonomic design); Edwin Tytyk, Wyd. Naukowe PWN, Warszawa-Poznań, 2001
Ergonomia produktu. Ergonomiczne zasady projektowania produktów (Product ergonomics. Ergonomic design principles of the product; Jan Jabłoński (red.), Wydawnictwo Politechniki Poznańskiej, Poznań, 2006
Butlewski M., Projektowanie i ocena wyrobów. - Poznań: Wydaw. Politechniki Poznańskiej , 2013. - 106 s. 121 podręcznik
Atlas miar człowieka. Dane do projektowania i oceny ergonomicznej (Atlas of human measure. The data for the design and evaluation of ergonomic evaluation); Adam Gedliczka, Wyd. CIOP, 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:
Makroergonomia (Macroergonomics); Leszek Pacholski, Aleksandra Jasiak, Wydawnictwo Politechniki Poznańskiej, Poznań, 2011
Zabłocki, M., Butlewski, M., Sydor, M. (2017). Ergonomiczne rozwiązania techniczne dla osób z niepełnosprawnościami stosowane w transporcie zbiorowym. Bezpieczeństwo Pracy ? Nauka i Praktyka, 553(10), 15?19.
Sydor, M., Zabłocki, M., Butlewski, M. (2017). Ergonomiczne wymagania stawiane pojazdom samochodowym dla osób z niepełnosprawnościami. Bezpieczeństwo Pracy ? Nauka i Praktyka, 553(10), 10?14.
Butlewski M., Misztal A., Belu N., An analysis of the benefits of Ethnography Design methods for product modeling, IOP Conf. Series: Materials Science and Engineering 145 (2016) 042023, IOP Publishing.

Butlewski M., Indirect Estimation Method of Data for Ergonomic Design on the Base of Disability Research in Polish 2011 Census, p. 454-462, [in]: Advances in Social and Organizational Factors, Edited by Peter Vink, CRC Press, Taylor and Francis Group, Boca Raton, London, New York, 2012, ISBN 978-1-4398-8
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
Kalemba A., & Butlewski, M. (2016). "Ergonomic design of store shelving for the elderly applying universal design with a focus on health and safety". Occupational Safety and Hygiene IV,.iczna stanowisk pracy, Ewa Górska, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 1998.

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