



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Ergonomics [S1IBiJ1>ERG]

Course

Field of study

Safety and Quality Engineering

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

compulsory

Number of hours

Lecture

15

Laboratory classes

30

Other (e.g. online)

0

Tutorials

15

Projects/seminars

0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Student has basic knowledge about the processes and conditions prevailing at workplaces, knows the basic production processes and rules of their organization, understands the basic concepts of organization and management sciences and the basics of work safety management.

Course objective

Provide students with theoretical and practical knowledge in the field of shaping safe and ergonomic working conditions, especially - in industrial and service enterprises, in manufacturing and service processes. Teaching measurement techniques for the assessment of the most important ergonomic factors. Developing the skills of critical observation of work processes in terms of safety and ergonomics as well as the ability to design changes in the design of devices and work organization, ensuring ergonomics and safety.

Course-related learning outcomes

Knowledge:

1. The student knows in depth the issues of technical safety, safety systems, occupational health and safety as well as threats and their effects. [K1_W02]

2. The student has advanced knowledge of aspects of safety and quality systems and their effects, risk assessment in the work environment as well as occupational accidents and diseases. [K1_W03]
3. The student has advanced knowledge of ergonomics, human ecology and environmental protection. [K1_W05]
4. The student has advanced knowledge of quality engineering in relation to products and processes. [K1_W07]
5. The student knows the fundamental dilemmas of modern civilization and development trends as well as the best practices in the field of assessment and shaping of the work environment, with the reference to ergonomic design. [K1_W10]

Skills:

1. The student can prepare the necessary resources for work in an industrial environment and knows the safety rules related to this work and can enforce their application in practice. [K1_U05]
2. The student can make a critical analysis of the way of functioning and assess, in connection with safety and quality engineering, the existing solutions of ergonomic design. [K1_U06]
3. The student can design, using appropriate methods and techniques, an object, system or process that meets the principles of ergonomic design and make its initial economic assessment. [K1_U07]
4. The student can plan, organize and implement individual and team work as well as conduct experiments, including measurements and computer simulations, interpret the obtained results and draw conclusions. [K1_U11]
5. Student can identify changes in requirements, standards, regulations and technical progress and the reality of the labor market, and on their basis define the need for supplementing knowledge related with ergonomics. [K1_U12]

Social competences:

1. The student can see the cause-and-effect relationships in the implementation of set goals and use ranks in relation to the importance of alternative or competitive tasks. [K1_K01]
2. The student is aware of the recognition of the importance of knowledge in solving problems in the field of ergonomics and continuous improvement. [K1_K02]
3. The student can initiate activities related to the formulation and transfer of information and cooperation in the society in the field of ergonomic assessment and design. [K1_K05]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Formative assessment:

- a) in the field of exercises: current checking of knowledge and skills during exercises
- b) in the field of lectures: on the basis of a discussion on the material assimilated at previous lectures;
- c) in the field of laboratories. The skills acquired during laboratory classes are verified on the basis of a final test, consisting of 5-7 tasks with different scores and partial assessments of the progress in the implementation of individual classes.

Summative assessment:

- a) in the field of exercises: on the basis of the results of the average of partial grades of the forming assessment
- b) in the field of lectures: examination in the form of a written test.
- c) for the laboratory: on the basis of the results of the average of the partial grades of the forming evaluation.

Programme content

The genesis of ergonomics in the context of the development of technology and science. The sciences of components and the nature of ergonomics. Ergonomics and occupational health and safety - economic aspects. The human system - a technical object and its surroundings. Interpretation of the system as a workplace. Purpose and scope of ergonomic activities. Contemporary trends in ergonomic research. Ergonomic diagnosis methods. Analysis of physical workload and the body's heat management. Analysis of work-related mental burdens. Principles of load optimization. Processes of perception and processing of information. Rules for the selection of signaling and control devices. Shaping the spatial parameters of the workplace, machines and hand tools with the use of anthropometric data. Assessment and shaping of the work environment (mechanical vibrations, noise, micro-climate, lighting, harmful radiation, air pollution). Principles of ergonomic design. Examples of ergonomic design of workstations:

processing, assembly, dispatching, computer.

Basic content of laboratory exercises:

- Physical capacity of the body and the BMI index.
- Human anthropometric features
- Visual work in changing lighting conditions.
- Absolute hearing threshold.
- Criteria for selecting the seat to the user.
- Acoustic conditions of the room
- Selected parameters of electric lighting.
- Feeling of mechanical vibrations.
- Simple and complex reactions.
- Sound and visual stimuli and making mistakes.
- Selected psychophysical possibilities.

Course topics

The origins of ergonomics against the background of technical and scientific developments

Component sciences and the nature of ergonomics

Ergonomics and OSH - economic aspects

The human-technical-object system and its environment

Interpretation of the system as a workplace

Purpose and scope of ergonomic activities

Modern trends in ergonomic research

Ergonomic diagnosis methods

Analysis of physical workload and thermal management of the body

Analysis of mental workloads

Principles of load optimisation

Perception and information processing processes

Principles for the selection of signalling and control devices

Design of spatial parameters of the workstation and of machines and hand tools using anthropometric data

Assessment and design of the work environment (mechanical vibration, noise, microclimate, lighting, harmful radiation, air pollution)

Principles of ergonomic design

Examples of ergonomic design of workstations: machining, assembly, dispatching, computer workstations

Core content of laboratory exercises:

Physical fitness and the BMI index

Human anthropometric characteristics

Visual work under changing light conditions

Absolute hearing threshold

Criteria for the selection of a seat for the user

Acoustic conditions in the room

Selected parameters of electric lighting

Sensation of mechanical vibrations

Simple and complex reactions

Auditory and visual stimuli and the making of mistakes

Selected psycho-physical abilities

Teaching methods

Lectures with a multimedia presentation and discussing examples of practical solutions

Laboratory exercises with the use of equipment for ergonomic measurements.

Bibliography

Basic:

1. Horst W. (ed.), Ergonomics with elements of safety and health protection at work, Wyd. Poznań University of Technology, Poznań, 2011
2. Olszewski J., Fundamentals of ergonomics and work physiology. Ed. University of Economics, Poznań, 1997
3. Tytyk E., Butlewski M. Ergonomics in technology. Ed. Poznań University of Technology, Poznań, 2011
4. Tytyk E., Ergonomic design, Wyd. PWN, Warsaw 2001

5. Wejman M., Diagnosing the work environment, Wyd. Poznań University of Technology, Poznań 2012
6. Norms and legal acts indicated during classes.

Additional:

1. Górski E., Ergonomics. I design, diagnosis, and experiments. Publishing House of the Warsaw University of Technology, 2002
2. Jabłoński J. (ed.), Product ergonomics. Ergonomic principles of product design, Publishing House of the Poznań University of Technology, Poznań, 2006
3. Koradecka D., (ed), Occupational safety and ergonomics, Ed. CIOP, Warsaw, 1999
4. Nowak E., Anthropometric Atlas of the Polish Population, Publishing House of the Institute of Industrial Design, Warsaw, 2000
5. Tytyk E., Mechanical vibrations and noise in terms of ergonomic engineering. Ed. Poznań University of Technology, Poznań 2021 (Open Access)
6. Butlewski M., Ergonomic design in the face of the dynamics of the human resource deficit, Poznań University of Technology 2018, ISBN: 978-83-7775-506-8; 255 pages

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	63	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	0	0,00