COURSE DESCRIPTION CARD - SYLLABUS

Course name

Ecodesign_and_ecotechnologies

Course

Field of study	Year/Semester
Mechanical and Automotive Engineering	3/6
Area of study (specialization)	Profile of study
Refrigerated vehicles	general academic
Level of study	Course offered in
First-cycle studies	polish
Form of study	Requirements
part-time	elective

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
9	18	0
Tutorials	Projects/seminars	
0	0	

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

dr inż. Jędrzej Kasprzak

email: jedrzej.kasprzak@put.poznan.pl

tel. +4861 665 2110

Wydział Inżynierii Transportu

ul. Piotrowo 3, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge:

Basic knowledge of the basics of machine construction and the theory of machines and mechanisms. Basic, structured knowledge of metal materials used in mechanical engineering. Basic knowledge of manufacturing techniques used in the machinery industry. Basic knowledge of the life cycle of machines, recycling of machine components, construction and consumables. Awareness how basic knowledge of machines and technologies affects the natural environment and the global energy balance.

Skills:

Ability to prepare technical documentation (descriptive and graphic) of an engineering task. Ability to create a system diagram, select its components and perform basic calculations. The ability to browse catalogs and websites of manufacturers of machine components for ready-made parts to be used in own projects. Ability to evaluate material, environment and workload when assembling a simple machine. Ability to organize and manage the process of designing an uncomplicated machine.

Social competences:

Awareness and understanding of the importance and impact of non-technical aspects of mechanical engineering activities and its impact on the environment and responsibility for own decisions.

Course objective

Gaining proficiency in the approach to product design, with particular emphasis on the product's environmental impact throughout its life cycle. Development and supervision of engineering tasks aimed at reducing the consumption of materials and energy in the machine design process. Engaging and expanding knowledge about the impact of technical facilities on the environment. History, applications and methodological assumptions of ecobalance methods, in particular life cycle assessment (LCA) method. The use of practical skills in the preparation of environmental analyzes and the use of specific environmental software.

Course-related learning outcomes

Knowledge

1. Student has basic knowledge of the basics of machine design and the theory of machines and mechanisms, including mechanical vibrations.

2. Student has basic, ordered knowledge of metal materials used in mechanical engineering, such as alloys of iron, aluminum, copper, etc. used in machine building, and in particular about their structure, properties, methods of production, heat and thermo-chemical treatment and the impact of plastic strength working on them .

3. Student has basic, structured knowledge of non-metallic and composite materials used in the construction and operation of machines, mainly ceramic materials, synthetic materials, non-metallic natural materials (wood, glass, stone) and fuels, lubricants, technical gases, refrigerants, etc.

4. Student has basic knowledge of manufacturing techniques used in the engineering industry, such as casting, forming, reducing and incremental machining, welding and other joining techniques, cutting, coating and surface treatments.

5. Student has elementary knowledge of the life cycle of machinery, recycling of machine elements and construction and consumables.

6. Student has elementary knowledge of the impact of machinery and technology on the natural environment and global energy balances.

Skills

1. Student can obtain information from literature, the Internet, databases and other sources. Can

integrate the obtained information, interpret and draw conclusions from it, and create and justify opinions.

2. Student can use computer office packages for editing technical texts, including formulas and tables, technical and economic calculations using a spreadsheet and running a simple relational database.

3. Student can apply basic technical standards regarding unification and safety and recycling.

4. Student can assess material, environmental and labor costs for making a simple machine.

5. Student has the ability to self-educate with the use of modern teaching tools, such as remote lectures, websites and databases, teaching programs, e-books.

Social competences

1. Student is ready to critically assess his knowledge and received content

2. Student is ready to recognize the importance of knowledge in solving cognitive and practical problems and to consult experts in case of difficulties in solving the problem on its own.

3. Student is ready to fulfill social obligations and co-organize activities for the benefit of the social environment.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures - written work (4-5 open questions, choice test), laboratories - report and presentation of the results of individual or group work (project - environmental life cycle analysis of selected object(s))

Programme content

Basic assumptions of ecodesign. Relation to the traditional design perspective. Principles of eco-design. Ecodesign procedure. Ecodesign tools. Ecodesign tools based on the principle of life cycle thinking. Examples of ecodesign (case studies). Ecodesign framework for selected machine categories. Terminology related to eco-balance and environmental issues. General issues related to the concept of environment (structure, resources, threats). Life cycle of technical objects. History of eco-balances. Methodology of ecological balances. Application and tools of eco-balance. Examples of ecobalins analysis with particular emphasis on the specifics of the activity, potential problems and interpretations. Simplified eco-weights. LCA as a component of LCM. Independent preparation of an environmental analysis of a selected technical facility.

Teaching methods

Lecture: multimedia presentations; laboratories: individual or group exercises supported by dedicated software, performed under the supervision of the subject tutor

Bibliography

Basic

Lectures - multimedial presentations.

Kauffmann J., Lee K-M. Handbook of Sustainable Engineering. Springer Ed. 2013

Wimmer W., Lee K.M. Polak J., Quella F., Ecodesign – the competitive advantage. Ed. Springer, 2010

Wimmer W., Zust R., Lee W K.M., ECODESIGN Implementation. A Systematic Guidance on Integrating Environmental Considerations into Product Development. Ed. Springer, 2004.

Yeang K., Ecodesign – a manual for ecological design. Wiley 2008

Additional

Wimmer W., Züst R., Lee K.-M. (2004): Ecodesign Implementation ? A Systematic Guidance on Integrating Environmental Considerations into Product Development, Dordrecht, Springer

Baumann H., Tillman A.: The Hitch Hiker’s Guide to LCA. An orientation in life cycle assessment methodology and application Sweden, 2004, ISBN ISBN 91-44-02364-2

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	27	1,0
Student's own work (literature studies, preparation for laboratories, preparation for tests) [1]	48	2,0

[1] delete or add other activities as appropriate