COURSE DESCRIPTION CARD - SYLLABUS

Course name
Assistive devices for human mobility [S2IBio1-UMiR>UWMC]

Course

Field of study
Biomedical Engineering

Year/Semester
1/2

Area of study (specialization)
Medical and Rehabilitation Devices

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

He/she has basic knowledge about the design and construction of mechanical devices, the basics of machine and equipment construction, automation and technology, and the selection of construction materials. He/she has the ability to independently acquire knowledge on a given topic and the ability to think logically. He/she has understands the need to extend their qualifications, is prepared to independently solve technical problems. Understanding the need for lifelong learning. Understanding the general social effects of engineering activities. Understanding the need for team collaboration.

Course objective

To provide students with basic knowledge about designing and constructing supporting human mobility aids devices. Developing students self-education skills with elements of independent learning and development of technical interests.

Course-related learning outcomes

Knowledge:
He/she has basic knowledge about engineering design process and engineering graphics that enables him/her to apply a systems approach to designing objects and processes and systems and elements of

machinery.
He/she has basic knowledge about engineering design process and engineering graphics that enables him/her to describe and apply processes and systems of operation, reliability and safety, elements of technical diagnostics of machines related to operational properties of materials.
He/she has detailed knowledge about engineering materials.
He/she has well-founded theoretical general knowledge about engineering mechanics, cracking and strength of materials that allows for calculation of force systems, equilibrium of coplanar and spatial forces.
He/she has basic knowledge about development trends of computer aided engineering design, which allows him/her to describe and present methods of recording construction, principles of projections and dimensioning, casting, simplified recording in geometric form and dimensions systems, read exploded views, finite elements methods (FEM) and boundary element method (MEB), selected numerical optimisation methods, FEM and MES application in computer aided design, application of computer graphics in creation of technical documentation, CAD/CAM systems.

Skills:
He/she knows how to retrieve information from literature, databases and other properly selected sources (also in English) in the area of biomedical engineering; in particular he/she knows how to describe issues in biochemistry and biophysics and how to combine this information with technical aspects and engineering design, how to interpret it and how to draw conclusions and formulate and justify opinions.
He/she has the skill of self-learning.
He/she knows how to apply analytical, simulation and experimental methods to formulate and solve engineering tasks. He/she knows how to formulate problems and how to use mathematical methods to analyze technical issues; he/she knows how to explain the role of chemical transformations in industrial processes.
He/she knows how to solve technical problems using laws of mechanics and carry out strength analyses of machine elements and mechanical systems.
He/she knows how to design engineering objects and technical processes using engineering graphics and computer-aided design CAD/CAM to design biomechanical elements.

Social competences:
He/she is well aware of the necessity for continuous learning and knows how to inspire and organize the process of learning of other people.
He/she knows how to prioritize in order to carry out a task either defined by him/herself or by others.
He/she is well aware of the social role of a graduate of a technical university, understands the need to formulate and inform the public through mass media about technical achievements and of other aspects of engineering activity and makes sure that such information and opinions are conveyed in a way that is generally understood.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lecture: acquired knowledge is verified by a exam. The exam consists open questions. Credit in the case of correct answers to min. half of the questions (50% threshold).
Project: the acquired skills will be verified by developing a complete project according to the received output data of the Human mobility aids devices: making the required selections and calculations, drawing documentation

Programme content

The human movement needs.
Geometry and kinematics according to anthropological features.
Construction, design of mobility aids of a mobility-impaired human being.

Course topics

Lecture:
Formulation of human movement needs. Determining geometry and kinematics (according to

anthropometric features). Ways and methods of device control. Material selection. Wheelchairs (with manual and mechanical drive, construction, types, drive system, supporting frame system). Stair devices (platforms, chairs). Devices that facilitate getting in and out of motor vehicles. Suspended devices to facilitate movement (for obese people). Adjusting the geometry of beds for patients. Methods of manufacturing device elements.
Project:
Execution of the project of a stair platform, part of a wheelchair, suspended lifts, manipulator or any other device chosen to support the mobility of a physically disabled person.

Teaching methods

Lecture: multimedia presentation, discussion.
Project: Solving design and construction problems. Searching for sources, individual or team work, discussions.

Bibliography

Basic
Sydor M., Wybór i eksploatacja wózków inwalidzkich, Wydawnictwo A.R., Poznań 2003.
Dega W., Ortopedia i rehabilitacja, PZWL, Warszawa 1968.
Brzeźniak B., Zaopatrzenie rehabilitacyjne, Wydawnictwo Via Medica, Gdańsk 2003.
Marciniak J., Szewczenko A.: Sprzęt szpitalny i rehabilitacyjny. Wyd. Politechniki Śląskiej, Gliwice 2003.
Będziński R. i inni: Biomechanika i inżynieria rehabilitacyjna, Akademicka Oficyna Wydawnicza EXIT, Warszawa 2004.
Kiel E. (ed.): Drive solutions. Mechatronics for Production and Logistics, Springer, Berlin 2008.
Pons J. L.: Wearable Robots: Biomechatronic Exoskeletons, John Wiley & Sons, Chichester 2008.
Additional
The Internet materials and catalogs of companies producing medical equipment

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