COURSE DESCRIPTION CARD - SYLLABUS

Course name
Design of recreational and strength training equipment [S1IBio1E>KSR]

Course

Field of study
Biomedical Engineering

Year/Semester
3/6

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
0

Tutorials
0

Projects/seminars
15

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of mathematics, mechanics, theory of mechanisms, and strength of materials, and other areas of education in the field of study. Structurized theoretical knowledge within the field of study studied. Ability to solve mathematical problem within the field of study. Ability to solve problems related to the statics of a rigid body. Understanding and practical solving of simple problems of the strength of materials and the basics of machine construction. Basic knowledge of technical drawing and engineering drawing as a source of information exchange. Ability to search for necessary information in literature, databases, the Internet and indicated sources. Ability to self-study and self-educate. Using information and communication techniques appropriate to the implementation of engineering tasks. Understanding the need for lifelong learning. Understanding the societal impact of engineering activities. Understanding the need for team collaboration.

Course objective

Presentation in concise and understandable knowledge related to the design of gym and recreational equipment. Overview of basic anthropometric models and their connection with selected structures. Presentation of calculation methods and models used in design, concentrating on modern calculation methods. Stressing out the possibility of solving problems with different methods, including the selection of effective methods appropriate for the problem being solved. Showing interconnection between mechanics, the theory of machines and mechanisms, and the basics of machine construction with biomedical engineering

Course-related learning outcomes

Knowledge:
The student has an extensive theoretical knowledge of mechanics, theory of machines and mechanisms, biomedical engineering and the basics of machine design.
The student understands the basic models and computational methods necessary for the calculation of mechanisms and strength calculations.
The student has basic information about trends, new materials, calculation methods used in practical design calculations.
The student has basic knowledge of anatomy and physiology, thanks to which he can present and describe: the basics of human anatomy and physiology.

Skills:
The student is able to solve simple tasks for complex models of structures subjected to various loads.
The student is able to obtain information from the literature on biomedical engineering and combine it with technical issues and engineering design, can integrate the obtained information, interpret it, as well as draw conclusions, formulate and justify opinions.
The student is able to make a kinematic diagram and an assembly drawing of the structure.
The student is able to assess the usefulness of routine methods and tools for solving a simple engineering task of a practical nature, characteristic of biomedical engineering, and to select and apply the appropriate method and tools.

Social competences:
Student understands the need for self-education related to the development of technology, understanding the importance of innovative solutions.
The student appreciates and understands the social and systemic effects of engineering activities.
The student has the ability to make appropriate decisions, critical analysis of decisions and risk analysis related to the safety of structures.
The student is aware of the importance of the subject in the design of safe and reliable engineering structures.
The student understands the importance of teamwork.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Project: assessment of the progress in the project realization over time, completion of the project in accordance with the requirements, positive assessments of the progress of the project as documented by the student in form of multimedia presentations
Lecture: Exam in the form of a written test, within the scope of lectures. Positive grade >50% of correct answers.

Programme content

Lecture:
1. Human anthropometric features and design ergonomics.
2. Basic mechanisms applied in gym and recreational equipment
3. Design of gym equipment for exercising the muscles of the upper body.
4. Design of gym equipment for exercising the muscles of the lower body.
5. Design of general gym equipment.
6. Design of specialized equipment.
7. Design of recreational equipment.

Project topics:
- design of gym equipment, e.g. exercise machine, equipment for exercising the muscles of the shoulder girdle, equipment for exercising the muscles of the lower limbs,
- construction of equipment for general development exercises, e.g. treadmill, ergometer

Course topics

none

Teaching methods

Lecture: a lecture supported by a multimedia presentation containing the discussed program content.
Project: solving practical problems, teamwork, discussion.

Bibliography

Basic:
1. Buczkowski Ryszard, Banaszek Andrzej: Mechanika ogólna w ujęciu wektorowym i tensorowym. WNT, 2006
2. Marian Ostwald: Podstawy wytrzymałości materiałów. Wydawnictwo Politechniki Poznańskiej, wydanie V, 2012.
3. Wawrzecki J.: Teoria Maszyn i Mechanizmów. Wydawnictwo Politechniki Łódzkiej, 2008.
4. Skoć Antoni, Spałek Jacek, Markusik Sylwester: Podstawy konstrukcji maszyn t. I i II. WNT, 2008.

Additional:
1. Raymond V. Smith, John H. Leslie: Rehabilitation engineering, CRC Press Inc., 1990.
2. Dostępne na rynku podręczniki z mechaniki ogólnej, konstrukcji maszyn oraz wytrzymałości materiałów.
3. Dostępne na rynku zbiory zadań z mechaniki ogólnej, konstrukcji maszyn oraz wytrzymałości materiałów.
4. Internet, wyszukiwarki naukowe.

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