COURSE DESCRIPTION CARD - SYLLABUS

Course name
Rehabilitation equipment and its medical application

Course

Field of study
Biomedical engineering
Area of study (specialization)

Level of study
First-cycle studies
Form of study
full-time

Year/Semester
3 / 5
Profile of study
general academic
Course offered in
polish
Requirements
compulsory

Number of hours

Lecture
15
Tutorials

Laboratory classes

Projects/seminars
15

Other (e.g. online)

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
dr n. med. Adam M. Pogorzała

Responsible for the course/lecturer:

Prerequisites

Basic knowledge of the anatomy and biomechanics of the musculoskeletal system

Course objective

Developing knowledge on the use of various devices used in the treatment of various diseases. To acquaint students with the mechanisms of the impact of various physical stimuli on the human body. Determining indications and contraindications for the use of various physical treatments.

Course-related learning outcomes

Knowledge

He/she has basic knowledge about anatomy and physiology, which allows him/her to present and describe: basics of human anatomy and physiology, organs and their functions, structure of human cells and tissues, functioning of cells and tissues (ion transport, gas exchange in the lungs, electrical potentials in the human body, structure, physiology and functioning of human body systems (musculoskeletal, nervous, digestive, respiratory, circulatory, genitourinary).

He/she ahs detailed knowledge about biomaterials, which allows him/her to classify and describe medical materials, materials for tissue anastomosis, wound dressing materials, materials for surgical instruments, construction materials in orthopaedic supply, materials for prosthetics and orthotics; he/she knows how to present and describe methods of passivation of biomaterial surfaces, issues in sterilisation and disinfection, orthopaedic inserts, cosmetic prostheses, rehabilitation equipment, methods of medical materials testing.

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; formulate and analyze problems; search for solutions of concepts; carry out engineering calculations, select and evaluate varying solutions; apply modelling, optimization and knowledge bases in engineering design, computer aided design process, technical drawing; to read drawings and schematic diagrams of machines, devices and technical systems; describe their structure and operation;

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; to use basics of computer aided design (CAD) in combination with computer aided materials selection (CAMS) and computer-aided manufacturing (CAM).

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 plan and carry out experiments including measurements and computer simulations, to interpret the results obtained and draw conclusions from them; also, he/she knows how to use computer aided design to solve technical problems and to interpret results of studies and to evaluate measurement errors.

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 cooperate and work in teams assuming various roles within.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Credit for the lecture is based on a test of the program content presented in the lectures (credit based on the correct answer to the questions: 5.0 -100-95%; 4.5-94-85%; 4.0 84-75%; 3, 5- 74-65%; 3.0- 64-50%; 2.0 below 50%).

Completion of the project part of the subject is based on the presentation of the design of the rehabilitation equipment and the presentation of the construction concept together with the assumptions of the student group - the project should include a technical drawing of the designed device or equipment, selection of materials and analysis of loads and displacements.

Programme content

Lectures:

1. Introduction into the subject "Rehabilitation equipment and medical application"

2. Historical overview of orthopedic supply over the centuries

3. Rehabilitation equipment used in the upper limb

4. Rehabilitation equipment used in the lower limb

5. Rehabilitation equipment used in the torso and spine

6. Rehabilitation equipment used for learning to walk

7. Rehababilitation equipment used to improve balance

8. Physical therapy devices (hydrotherapy, phototherapy, electrotherapy, thermotherapy, cryotherapy, magnetotherapy, ultrasounds) with a discussion of indications of contraindications for physical procedures and health and safety rules for patients and medical staff

Projects:

1. Overview of selected medical equipment and medical devices along with the review and analysis of devices available on the market

2. Determining the goal and assumptions of the project, including the possibility of modifying the design, with regard to the anatomy of the human body and its biomechanics, as well as physiological processes in the case of designing medical equipment

3. Hardware design using computer programs (CAD)

4. Analysis of loads and displacements

5. Presentation and discussion of the completed project

Teaching methods

Multimedia presentation, presentation of selected rehabilitation equipment (orthoses etc.)

Bibliography

Basic

1. „Ortopedia i Rehabilitacja”, tom I i II, pod redakcją W. Marciniaka, A. Szulca, PZWL, Warszawa, 2003.

2. "Wiktora Degi ortopedia i rehabilitacja" red. J. Kruczyński, A. Szulc, PWZL Warszawa 2015

3. "AAOS atlas of orthoses and assistive devices" [edited by] John D. Hsu, John W. Michael,

John R. Fisk.—4th ed. Mosby Elsevier 2008

Additional

1. C. Liebenson: Rehabilitation of the spine a practitioner’ s Manual, W:Lippincott Williams& Wilkins, 2006

2. Lisa Maxey: Rehabilitation for the postsurgical orthopedic Patient 2e, W: Mosby, 2007

3. R. C. Manske: Postsurgical orthopedic sports rehabilitation, W.Mosby 2006

4. T. S. Ellenbecker: Shoulder rehabilitation,W: Georg Thieme Verlag 2006

5. Michael A. Pagliarulo: Introduction to physical therapy, W: Elsevier Science Publishers 2006

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2
Classes requiring direct contact with the teacher	30	1
Student's own work (literature studies, preparation for tutorials, preparation for tests, project preparation) [1]	20	1

[1] delete or add other activities as appropriate