COURSE DESCRIPTION CARD - SYLLABUS

Course name
Medical imaging techniques

Course

Field of study
Biomedical engineering
Area of study (specialization)
-
Level of study
First-cycle studies
Form of study
full-time

Year/Semester
3/6
Profile of study
general academic
Course offered in
Polish
Requirements
compulsory

Number of hours

Lecture
15
Laboratory classes
15
Other (e.g. online)
0
Tutorials
0
Projects/seminars
0

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
dr hab. inż. Paweł Drapikowski, prof. PP

Responsible for the course/lecturer:

Prerequisites

The student starting the subject should have a basic knowledge of physics, biophysics, mechanics, electronics. One should also be able to obtain information from specified sources and be willing to cooperate as part of a team.

Course objective

Understanding the basics of medical imaging in the field of ultrasound, RTG, CT, MRI, PET, intraoperative navigation systems as well as scanning and creating 3D surface models.

Course-related learning outcomes

Knowledge

1. The student should understand the physical basics of basic types of medical imaging.

2. The student should learn the structure and operation of basic medical imaging devices.

3. The student should characterize the basic methods of image processing and analysis.

Skills

1. Student is able to formulate the criteria for selecting the appropriate imaging device.

2. Student is able to identify the basic elements of a medical device and make a critical analysis of how it works.

3. Student is able to formulate tasks related to the operation and maintenance of the imaging device.

Social competences

1. Student is able to cooperate in a group.

2. The student is aware of the importance of understanding the medical aspects of engineering activities.

3. Student is able to interact with medical staff.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Credit based on a written exam at the end of the semester. Receiving a positive evaluation is obtaining at least 50% of the possible points.

Laboratory: Credit based on an oral or written answer regarding the content of each laboratory exercise performed, reports on the exercise carried out as instructed by the instructor and placed in the teaching materials of the laboratory. Completion of the laboratory is obtained after obtaining a positive assessment of all laboratory classes.

Programme content

Lecture:

Subject content includes presentation of basic methods of medical imaging such as: ultrasound, x-ray imaging, computed tomography, magnetic resonance imaging and positron emission tomography. The presentation of each technology includes: physical basics, image creation methods, security principles and performing basic service activities using phantoms.

The course syllabus also includes content on the construction and operation of intraoperative navigation systems, rapid prototyping methods and their medical applications, bioprinting issues and structured lighting scanning

Laboratory:

1. Examination of the properties of ultrasound heads

2. Acquiring ultrasound images

3. Doppler measurements

4. Analysis and processing of images from MRI and CT

5. Scanning and creating 3D models of human body fragments and dental models

Teaching methods

1. Lecture: multimedia presentation illustrated with examples of medical equipment.

2. Laboratory exercises: independent performance of exercises using ultrasound scanners and data processing, discussion.

Bibliography

Basic

1. L. Chmielewski, J.L. Kulikowski, A. Nowakowski, M. Nałęcz (red.), Biocybernetyka i inżynieria biomedyczna 2000, tom 8, Obrazowanie biomedyczne, Akademicka Oficyna Wydawnicza EXIT, Warszawa 2003.

2. R. Tadeusiewicz, J. Smietański, Pozyskiwanie obrazów medycznych oraz ich przetwarzanie, analiza, automatyczne rozpoznawanie i diagnostyczna interpretacja, WSTN Kraków 2011.

Additional

1. B. Pruszyński, Diagnostyka obrazowa, Wydawnictwo Lekarskie PZWL, Warszawa 2000.

2. H. Kowalski, Metody obrazowania w diagnostyce medycznej i terapii - skrypt dla studentów WUM, Warszawa 1997.

3. Inżynieria biomedyczna, kwartalnik Polskiego Towarzystwa Inżynierii Biomedycznej.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	20	1,0

[1] delete or add other activities as appropriate