POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

COURSE DESCRIPTION CARD - SYLLABUS

Course name
3D scanning in biomedical applications

Course

Field of study	Year/Semester
Biomedical Engineering	2/3
Area of study (specialization)	Profile of study
Implant and prosthetic engineering	general academic
Level of study	Course offered in
Second-cycle studies	Polish
Form of study	Requirements
full-time	elective

Number of hours

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

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

dr hab. inż. Michał Rychlik
email: michal.rychlik@put.poznan.pl
tel. 61 665 2167
Instytut Mechaniki Stosowanej
Wydział Inżynierii Mechanicznej
ul Jana Pawła II 24, 60-965 Poznań

Responsible for the course/lecturer:

Prerequisites

Knowledge: It has a basic knowledge of the following methods: computer aided design - CAD, solid modelling of construction in CAD systems, the basic measurement methods in the field of geometric metrology

POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

Skills: He can plan and carry out measurements, computer simulations and interpreted the results

Social competencies: He can interact and work in a group.

Course objective

Acquiring knowledge about the importance and possibilities of Reverse Engineering in the aspect of medical applications and biomedical engineering. Acquainting with the basic methods of 3D scanning of biomedical objects, such as skeletal bones (using anatomical casts and 3D prints), limbs and elements of the human body (such as face, ears, etc.) and with the processing of the obtained measurement data. Acquiring the ability to select the right biomedical device (3D scanner) and the ability to apply an appropriate strategy for the data acquisition (scanning) process, adequately to the type and specificity of the scanned biomedical object.

Course-related learning outcomes

Knowledge

Knows the modern methods of engineering computer graphics and the theoretical foundations of engineering calculations using the finite element method.

Has general knowledge about the types of tests and methods of testing working machines using modern measuring techniques and data acquisition.

Skills

The student is able to plan and carry out experiments, including measurements and computer simulations, interpret the obtained results and draw conclusions.

Student is able to carry out basic measurements of mechanical quantities on the tested working machine using modern measuring systems.

Social competences

The student is able to interact and work in a group, assuming various roles in it.

Is ready to critically assess knowledge and received content.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Assessment of individual work related to the operation of various scanning systems (methods: laser, structured light, contact), measurements and reconstruction of geometry of biomedical objects in specialized software for Reverse Engineering (Reverse Engineering).

Practical tests of the tasks set for student regarding the ability to work with a given type of 3D scanner and biomedical objects - conducted every second week of lectures.

Obligatory reports on laboratory activities - one report within a single work group (applies to a laboratory).

The final test in theoretical knowledge - written form duration 1,5h. The test is conducted after a whole series of lectures. It includes a minimum of three questions by single question of the knowledge area:

POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

pl. M. Skłodowskiej-Curie 5, 60-965 Poznań

basic definitions of Reverse Engineering, construction and operation principles of the selected 3D scanner (due to the measurement method), methods of 3D geometry reconstruction of biomedical objects based on data from 3D scanners.

Programme content

Presentation of basic definitions in the field of Reverse Engineering and 3D scanning. Presentation of the main types of 3D scanners, taking into account the measurement methodolgy, range of operation and special-purpose of devices. Detailed description of the construction and operation of 3D scanners: contact, laser, structured light, as well as photogrammetric methods. Acquainting with the techniques of measuring biomedical objects at laboratory stands equipped with 3D scanners: contact, laser and structured light. Introducing students to the process of reconstructing the geometry of scanned objects depending on the type of data obtained and the type of biomedical object. Acquainting with the methods of geometry reconstruction and data processing from a point cloud to a NURBS surface.

Teaching methods

1. Lecture with multimedia presentation.

2. Laboratory exercises: multimedia presentation, performance of tasks given by the teacher using 3D scanners and specialized software for Reverse Engineering, implementation of individual measurement tasks indicated by the teacher of 3D biomedical objects.

Bibliography

Basic

1. Chlebus. E.: Techniki komputerowe CAx w inżynierii produkcji, WNT Warszawa 2000

2. Jakubiec W., Malinowski J.: Metrologia wielkości geometrycznych, WNT Warszawa 2007

3. Butowtt J., Kaczyński R.: Fotogrametria, Wojskowa Akademia Techniczna 2003

Additional

Lecture materials and other thematic articles provided by the lecturer.

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	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, project preparation) [1]	30	1,0

---

[1] delete or add other activities as appropriate