COURSE DESCRIPTION CARD - SYLLABUS

Course name
Advanced 3D modeling and the basics of reverse engineering [S1IBio1E>Zm3D]

Course

Field of study
Biomedical Engineering

Year/Semester
3/5

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
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

Lecturers

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 Skills: He can plan and carry out measurements, computer simulations and interpreted the results Social competencies: He understand the needs of learning and acquiring new knowledge.

Course objective

Acquiring knowledge and skills in the field of creating a model of a technical object with complex geometry using advanced 3D modeling tools, in particular objects with organic shapes, surface and hybrid modeling. Acquiring practical knowledge and skills in using advanced tools of specialized engineering software as well as modifying and controlling the geometry of the 3D model. Gaining knowledge of the basics of Reverse Engineering, its importance in design and application in the process of creating 3D geometry.

Course-related learning outcomes

Knowledge:
k_w05 - has basic knowledge of engineering design and engineering graphics, allowing to design objects and processes, systems in terms of systems, machine elements; formulate and analyze problems; seek solutions concepts in biomedical asekcie construction.
k_w20 - has a basic knowledge of the development trends of computer-aided engineering design in the

field of biomedical engineering, so that can describe and demonstrate ways of recording construction, mapping and dimensioning rules, the use of computer graphics in the creation of technical documentation and recording of biomedical objects.

Skills:
k_u08 - be able to plan and carry out experiments, including measurements and computer simulations, interpret the obtained results and draw conclusions.

Social competences:
k_k04 - is able to set priorities for implementation specified by the tasks themselves or others.
k_k03 - is able to interact and work in a group, assuming different roles in it.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Assessment of individual work related to the operation of specialized software and procedures of advanced three-dimensional modeling.
Practical tests of the tasks set for the student regarding advanced 3D modeling and integration of control elements of modeled geometry in the context of biomedical engineering.
Report on the implementation of tasks assigned to the student in the laboratory.
Final credit in the acquired knowledge and practical modeling skills with the use of advanced CAD tools (the form of a practical test and / or execution of a design task). Passing threshold: 50% of points

Programme content

Presentation of basic definitions in the field of advanced tools of 3D modeling systems. Practical application of advanced functions of selected CAD tools and programs, with particular emphasis on modeling objects with complex geometry occurring in the biomedical environment and other technical objects with organic shapes.
Practical use of advanced tools of Rhinoceros 3D and Blender for surface modeling with simultaneous use of all elements of creating 3D geometry (solids, surfaces, curves). To familiarize students with advanced operations for creating a 3D surface based on a network of curves, a deformable plane, lofting along two curves, "rails" maintaining edge continuity; transformation tools such as twisting, bending the 3D model, flowing along a curve, unfolding unfolding surfaces. In addition, the use of 3D model geometry control tools with the use of a skeleton control element system. Design and modeling of objects with complex geometry and organic shapes.
Getting basic knowledge of Reverse Engineering, introduction to the principle of a typical 3D scanner and integration of data obtained from the 3D scannerand with the geometry of development 3D model.

Teaching methods

1. Lecture with multimedia presentation.
2. Laboratory exercises: presentation of advanced methods and tools used in selected CAD systems, practical application of selected advanced techniques and execution of tasks given by the teacher, implementation of an individual 3D model with complex geometry.

Bibliography

Basic
1. Wprowadzenie do inżynierii rehabilitacyjnej : praca zbiorowa, Pod. Red.: Marek Zabłocki, Wydawnictwo Politechniki Poznańskiej, 2017, ISBN: 978-83-941828-1-6
2. Winkler T.: Komputerowo wspomagane projektowanie systemów antropotechnicznych, WNT Warszawa 2005
3. Tejszerska D., Świtoński E.: Biomechanika inżynierska - zagadnienia wybrane laboratorium. Wydawnictwo Politechniki Śląskiej, Gliwice 2004
4. Jabłoński J.: Ergonomia produktu. Ergonomiczne zasady projektowania produktów. Wydawnictwo Politechniki Poznańskiej, Poznań 2006
Additional
1. Chlebus. E.: Techniki komputerowe CAx w inżynierii produkcji, WNT Warszawa 2000
2. André Kutscherauer: 3D Car Modeling with Rhinoceros, 2011

3. Skarka, Wojciech: CATIA V5. Podstawy budowy modeli autogenerujących, Gliwice, Helion, 2008
4. Wełyczko, Andrzej: CATIA V5. Sztuka modelowania powierzchniowego, Gliwice, Helion, 2008

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00