Co-funded by the Erasmus+ Programme of the European Union

BIOART Engineering education for human welfare

DESCRIPTION OF THE COURSE SYLLABI

ZNTU, UA 22 January, 2019	
TITLE OF THE COURSE	**Code**
CAD OF BIOMEDICAL DEVICES AND STRUCTURES	**M1.6 M3.5**

Teacher(s)	Department
Coordinating: Anzhelika Parkhomenko Others: Olga Gladkova	**Software Tools**

Study cycle	Level of the curricula	Type of the curricula
MA	**2**	**elective**

Form of delivery	Duration	Language(s)
Theory/lab	**15 weeks**	**Ukr/Eng**

Prerequisites	
Prerequisites: Basics of Electronics and Electrical Engineering, Engineering graphics and drawing	**Co-requisites (if necessary):**

ECTS	Total student workload hours	Contact hours	Individual work hours
4,5	**135**	**56**	**79**

Aim of the course: competences foreseen by the study programme		
Studying of modern information technologies in the field of design and manufacture of biomedical devices and structures, as well as getting practical skills of modern CAD systems and 3D printing technologies application		
Learning outcomes of the course	**Teaching/learning methods**	**Assessment methods**
Students will get acquainted with modern technologies of biomedical devices and structures design and rapid prototyping	**Theory**	**exam**
Students will be able to build 3D models and investigate virtual prototypes of biomedical structures	**Theory, labs**	**exam, labs reports**
Students will have hands-on experience of integrated (electro-mechanical) biomedical devices development based on ECAD, MCAD systems usage	**Theory, labs**	**exam, labs reports**
Students will be able to select necessary materials for biomedical structures 3D printing, prepare 3D models for 3D printing and realize the 3D printing processes	**Theory, labs**	**exam, labs reports**

Themes	Contact work hours							Time and tasks for individual work	
	Lectures	Consultation	Seminars	Practical work	Laboratory work	Placements	Total contact work	Individual work	Tasks
Module 1. CAD systems for integrated (electro-mechanical) biomedical devices and structures development	**14**				**16**		**30**	**39**	
1.1 Classification and features of modern CAD-systems	2						2	9	Reading literature
1.2 MCAD structural design 1.2.1 Structure and possibilities of Creo 1.2.2 Development and investigation of 3D virtual prototypes of biomedical devices and structures	6				10		16	15	Reading literature and preparing labs reports
1.3 ECAD electronic and schematic design 1.3.1 Structure and possibilities of ALTIUM DESIGNER 1.3.2 Basic concepts, stages and technologies of design, manufacture and control of electronic circuits and printed circuit boards	6				6		12	15	Reading literature and preparing labs reports
Module 2. Advanced techniques of biomedical devices and structures rapid prototyping	**14**				**12**		**26**	**40**	
2.1 Classification of prototyping technologies 2.1.1 Prototyping embedded devices 2.1.2 Prototyping the physical design	4						4	15	Reading literature and preparing labs reports
2.2 Introduction to the technology of 3D printing 2.2.1 Materials for 3D printing/bio-printing 2.2.2 Technologies of 3D printing	6				6		12	15	Reading literature and preparing labs reports
2.3 Prototyping of robotic prosthesis 2.3.1 Prototyping of electronic and software parts of the robotic prosthesis 2.3.2 Prototyping the physical design of a robotic prosthesis	4				6		10	10	Reading literature and preparing labs reports
Is viso	**28**				**28**		**56**	**79**	

Assessment strategy	Weight in %	Deadlines	Assessment criteria
Final exam	40	20	Grade A (excellent) - clarity of expression – excellent, confident delivery, practical tasks – full done. Grade B (good) – clarity of expression – good, thoughts and ideas clearly expressed, practical tasks - well done. Grade C (good) - clarity of expression – well-placed, delivery is fluctuating, practical tasks - well done. Grade D (passed) - clarity of expression – poor, delivery is fluctuating, practical tasks done with mistakes. Grade E (fail) - failure in theoretical or practical tasks.
Products and performance assessments	60	40	All labs reports should be passed

Author	Year of issue	Title	No of periodical or volume	Place of printing. Printing house or internet link
Compulsory literature				
Parkhomenko A.V., Pritula A.V., Krishchuk V.M.	2016	Computer aided design of electronic devices in CREO and ALTIUM DESIGNER		Zaporizhzhia, Dyke pole http://eir.zntu.edu.ua/handle/123456789/1968
Parkhomenko A.V, Gladkova O.M., Zalyubovskiy Ya.I., Parkhomenko A.V.	2017	Engineering of Embedded Systems		Zaporizhzhia, Dyke pole http://eir.zntu.edu.ua/handle/123456789/1969
Additional literature				
McEwen A., Cassimally H.	2014	Designing the Internet of Things		New Jersey, USA, Wiley
Shih, Randy H.	2011	Parametric Modeling with Creo Parametric 1.0		SDC Publisher: Stepher Schroff
Gopinath Chintala	2011	Trends in CAD/CAM. To Capture Global Markets		LAP Lambert Academic
Maluh V.N.	2010	Introduction to modern CAD systems: a course of lectures		Moscow, DMK Press
Sukhodolskiy, V.Y.	2009	Altium Designer. Designing functional units RES on PCBs		Sankt Petersburg, BHV-Petersburg
Sabunin, A.E.	2009	Altium Designer. New solutions in the design		Moscow, Solon Press