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Developed in the frame of project "Erasmus+ (CBHE) BioArt "Innovative Multidisciplinary Curriculum in Artificial Implants for Bio-Engineering BSc / MSc Degrees" (586114-EPP- 1-2017- 1-ES- EPPKA2-CBHE- JP).

DESCRIPTION/Syllabi of Curricula/Module

Short Name of the University/Country code **Date (Month / Year)**	VNTU
TITLE OF THE MODULE	**Code**
Modern information technologies in science and education	

Teacher(s)	**Department**
Coordinating: Sergey Sukhorukov, PhD **Others:**	Machine building technology and automation

Study cycle **(BA/MA)**	**Level of the module** **(Semester number)**	**Type of the module** **(compulsary/elective)**
MA	1th semestr	Compulsary

Form of delivery **(theory/lab/exercises)**	**Duration** **(weeks/months)**	**Language(s)**
Lectures/lab/exercises	12 weeks	Ukr / English

Prerequisites	
Prerequisites: Knowledge: basic knowledge of design, construction of information systems and biotechnical systems Skills: ability to search information	**Co-requisites (if necessary):** Students should have skills to work in basic computer software

ECTS (Credits of the module)	Total student workload hours	Contact hours	Individual work hours
4	120	45	75

Aim of the module (course unit): competences foreseen by the study programme		
Students should be able to: - to set, research, analyze and solve complex engineering problems and problems of biomedical engineering. - to freely use modern methods of collecting, processing and interpreting scientific and technical information for preparation of design and analytical decisions in the field of biomedical engineering. - to analyze complex medical engineering and bioengineering problems and formalize them to find quantitative solutions using modern mathematical methods and information technologies		
Learning outcomes of module (course unit)	**Teaching/learning methods (theory, lab, exercises)**	**Assessment methods (written exam, oral exam, reports)**
Knowledge: Producers have a broad knowledge of the choice and use of modern information technology in conducting scientific research on bioengineering facilities; on popular numerical methods for solving algebraic and differential equations.	Slides, lecture notes, suggested books and literature, personal reports, written papers	Written/oral exam, essays
Skills: Ability to program numerical solutions for typical models in biomechanics. Skills related to visualizing the results with a simple user interface. Ability to solve complex problems in MatLab environment.	Lectures, working groups, individual work	Exercise and laboratory reports
Competences: To conduct a critical analysis of the literature, the results of studies of biomechanical models of joints of the body, to apply knowledge in practice, to exchange opinions and to substantiate conclusions, to present results	Working groups	Exercise reports and presentations

Themes	Contact work hours							Time and tasks for individual work	
	Lectures	Consultations	Seminars	Practiacl work	Laboratory work	Placements	**Total contact work**	**Individual work**	**Tasks**
Modern information technologies and their verification in science and education	1						**1**	**2**	To study and understand questions: The concept of information technology. The feasibility and effectiveness of the use of informatics in science and education
Criteria for information technology efficiency	1						**1**	**2**	The general criterion for the effectiveness of information technology. Problems and criteria for choosing information technologies
Distributed information systems for wireless monitoring of vital functions of the human body	2						**2**	**3**	To study and understand questions: Personal PAN technologies. Medical technology for monitoring and distributed data storage and processing. Scheme of organization of remote monitoring. Remote telemonitoring using implanted devices.
Wireless medical technology	2						**2**	**3**	To study and understand questions: Remote monitoring of patients. Monitoring of patients' complement; monitoring of asthma and COPD symptoms; non-invasive wireless monitoring of sugar and insulin levels; monitoring of cardiac patients.
Introduction to modeling in biomechanics	3						**3**	**5**	Basic information about popular approaches to modeling in biomechanics.
Structural analysis of human joints and their models.	3						**3**	**5**	The main components of the joints of the human body. Examples of joint models..
Introduction to Python and Matlab programming	3						**3**	**5**	Code vectoring methods and graphing using Matlab. Python programming language.
Introduction to numerical methods in one-dimensional space in statics and dynamics	3						**3**	**5**	Numerical methods for solving algebraic and differential equations are popular. Statics and speakers equation for one-dimensional space
Rigid body statics in two dimensions	3						**3**	**5**	Principles of modeling, calculation and visualization of results for the selected joint in the statics
Rigid body dynamics in two dimensions	3						**3**	**5**	Principles of modeling, calculation and visualization of results for the selected joint in dynamics
Statistical processing	3						**3**	**5**	Statistical processing of measurement

of measurement results									results, principles of testing scientific hypotheses and verification of mathematical models
Laboratory study					4 4 5 5		**18**	**30**	Development and analysis of wireless network technology to monitor the state of physiological indicators of the object. Creating multi-body rigid models. Modeling the interaction of the components of a multi-body model in Matlab system . Python programming in the interaction of components of a multi-body model.
Total	**27**				**18**		**45**	**75**	

Assessment strategy	**Weight in %**	**Deadlines**	**Assessment criteria**
Laboratory works attendance and exercise reports	30		Attendance and reports
Colloquium (theory control)	30		Test
Individual tasks	15		Essays and presentations
Final exam	25		Test

Author (s)	**Year of publication**	**Name**	**Periodical number or volume**	**Place of publication. Publisher or internet link**
Main sources				
Rappaport, T. S., Heath Jr, R. W., Daniels, R. C., & Murdock, J. N.	2015	Millimeter Wave Wireless Communications	260 p.	Pearson Education
Fong, B., Fong, A. C. M., & Li, C. K.	2011	Telemedicine technologies: Information technologies in medicine and telehealth	ISBN: 978-0-470-74569-4	John Wiley & Sons
Злепко С. М., Тимчик С. В., Федосова І.В. та ін.	2017	Сучасні інформаційні технології в науці та освіті	146	Вінниця: ВНТУ
Machado M., et al.	2010	Development of a planar multibody model of the human knee joint	60 (3), p. 459- 478	Nonlinear Dynamics
Гриценко В.І.,	2015	Інформаційні	382 с.	К: Наук. думка

Котова А.Б., Вовк М.І., Кіфоренко С.І., Бєлов В.М.		технології в біології та медицині. Курс лекцій: навчальний посібник		
Caruntu D. I., Hefzy M. S.	2004	3-D anatomically based dynamic modeling of the human knee to include tibiofemoral and patello-femoral joints.	126(1), p. 44- 53	Journal of Biomechanical Engineering
Machado M., et al.	2012	Compliant contact force models in multibody dynamics: Evolution of the Hertz contact theory	53,99-121	Mechanism and Machine Theory
Mircea Ancău	2019	Practical Optimization with MATLAB	275 c.	Cambridge Scholars Publishing
Additional sources				
Shabana A. A.	2010	Computational Dynamics		John Wiley & Sons
Ганжела С.І., Шлянчак С.О.	2017	Основи інформатики з елементами програмування та сучасні інформаційні технології навчання	88 с.	РВВ КДПУ ім. В. Винниченка

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