

DESCRIPTION/Syllabi of Curricula/Module

Short Name of the University/Country code Date (Month / Year)	PSTU Ukraine Sep 2019
TITLE OF THE MODULE	Code
Sensors for Biomedical Application	

Teacher(s)	Department
Coordinating: Oleksiy Koyfman, PhD Others:	Department of automation and computer-integrated technologies

Study cycle (BA/MA)	Level of the module (Semester number)	Type of the module (compulsary/elective)
Masters	Any semester for Masters	Elective

Form of delivery (theory/lab/exercises)	Duration (weeks/months)	Language(s)
Lectures, Seminary	16 weeks	Ukrainian/English

Prerequisites	
Prerequisites: Knowledge: Basic knowledge of physics chemistry, biology, linear algebra Skills: ability to search information in the Internet. Competences: none	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
6	180	64	116
Aim of the module (course unit): competences foreseen by the study programme			
Students should be able to solve engineers tasks related to the operation and use of optical sensors in medicine.			
Learning outcomes of module (course unit)	Teaching/learning methods (theory, lab, exercises)	Assessment methods (written exam, oral exam, reports)	
Knowledge: Knowledge of principles of probing biological parameters related to the health of the human body Knowledge of principles of optical sensors used for biomedical applications popular approaches in biomechanical modeling.	Work with the lecture notes as well as on the available fundamental subject literature	Knowledge test	
Skills: - mutual understanding of technical and biological aspects based on working mechanisms of optical sensors; - design and development of optical sensors.	Lectures, project, consultation	Active attendance on lectures, individual/group project and presentation	
Competences: Study the subject literature, exchange knowledge, working in group	Lectures, project, consultation	Individual/group project and presentation	

Themes	Contact work hours							Time and tasks for individual work	
	Lectures	Consultations	Seminars	Practical work	Laboratory work	Placements	Total contact work	Individual work	Tasks
1. Introduction to Biomedical Sensors	4				4		8	14	The use of optical sensors is an integral part of bioengineering
2. Optical Sensors based on Light Absorption	4				4		8	14	Dual Wavelength HCT Measurement. Laser Doppler Blood Flow Sensor
3. Blood Analytics Immuno-assay based Optical Methods	4				4		8	14	Enzyme-linked Immunosorbent Assay (ELISA)
4. Label-free Photonic Biosensors	4				4		8	14	Evanescence field detection
5. Sensors based on Surface Plasmon Resonance (SPR)	4				4		8	14	Applications of SPR Biosensing
6. Biosensor Microsystems	4				4		8	14	Integrated MZ Interferometer
7. Photonic Crystal based Sensors	4				4		8	14	Bloch Waves, Band Diagram
8. Physical Principles of Fluorescence based Sensors	4				4		8	14	Fluorescence Quenching
Total	32				32		64	116	

Assessment strategy	Weight in %	Deadlines	Assessment criteria
Individual or group final project referred during seminars	20	3 th - 14 th week	Project
Final exam	80		Test

Author	Year of issue	Title	No of periodical or volume	Place of printing. Printing house or internet link
Compulsory literature				
Saleh, Bahaa E. A.	2007	Fundamentals of Photonics 2nd edition		Wiley, ISBN: 978-0-471-35832-9
Yang, Guang-Zhong	2018	Implantable sensors and systems; from theory to practice		Springer, ISBN 987-3-319-69748-2
Andreas Inmann, Diana Hodgins	2013	Implantable sensor systems for medical applications		Woodhead Publishing, ISBN 9781845699871
Additional literature				
Dipl.-Ing. Dr. Martin Brandl	2018	Optical Sensors for Biomedical Applications. Part 1: Interaction of Light with Matter		PowerPoint Presentetion
Dipl.-Ing. Dr. Martin Brandl	2018	Optical Sensors for Biomedical Applications. Part 2: Optical Sensors		PowerPoint Presentetion
Dipl.-Ing. Dr. Martin Brandl	2018	Optical Sensors for Biomedical Applications. Part 3: Optical Sensors		PowerPoint Presentetion