Calendar rating-plan for studying the discipline

Marks		
«Excellent»	A+	96–100 points
	A	90–95 points
«Good»	B+	80–89 points
	B	70–79 points
«Satisfied»	C+	65–69 points
	C	55–64 points
Passed	D	more or 55 points
Unsatisfied	F	less than 55 points

CALENDAR RATING-PLAN
for studying the discipline

«Optical Methods in Biology and Medicine»

for students of group 1DM6I, Institute of Non-Destructive testing,

Master Degree Program 12.04.04 «Biotechnical Systems and Technologies»,
profile: Biomedical Sciences and Engineering

3 semester of 2017/2018 academic year
Lecturer: Gubarev Fedor Alexandrovich

Lectures, h	16
Practice, h	8
Laboratory work, h	24
Total	48
Self-Guided work, ч	60
Total, h / credits	**108/3**
Final assessment	Exam

Результаты обучения по дисциплине:

CLO 1 (РД1)	To provide search, analysis of scientific and technical information according to the subject of the study, use the achievements of science, engineering and technology.
CLO 2 (РД2)	To perform calculations and design of optical medical systems for diagnostics and therapy.
CLO 3 (РД3)	Perform setup, repair and verification of laser and light equipment for medical and biological research.

Assessment	**Number**	**Points**
Tests	**4**	**20**
Defending of Lab-works	**6**	**30**
Presentation / Proposal to Forum	**1**	**10**
Total:		**60**

Week	Date	Results	Types of activity	Hours		Assessment								Points	Technology of classes	References		
				Classes	Self-Guided Work	Essay	Talk	Practice Defending	Control Work	Individual work	Test	Presentation	Lab defendi			Literature	Web	Multimedia
1-4		РД1-3	**Module 1.** Fundamentals of Optical Methods															
1			Lecture 1. Introduction to optical methods of research.	2												PRM 1-5, SUP1-4		
			Self-guided work / Входное тестIRование		2						5					PRM 1-5, SUP1-4		
2			Laboratory work No 1: Study of optical fiber light transmission.	4									5			PRM 1-5, SUP1-4	IR 1-3	
			Self-guided work		2											PRM 1-5, SUP1-4	IR 1-3	
3			Lecture 2. Fundamental optical properties of objects.	2												PRM 1-5, SUP1-4		
			Self-guided work		2											PRM 1-5, SUP1-4		
4			Laboratory work No 2: Microscopic and endoscopic diagnostics.	4									5			PRM 1-5, SUP1-4	IR 1-3	
			Self-guided work		2											PRM 1-5, SUP1-4	IR 1-3	
5			Lecture 3. Fundamental physical processes.	2												PRM 1-5, SUP1-4		
			Self-guided work		2											PRM 1-5, SUP1-4		
6			Laboratory work No 3: Basics of laser safety. A study of the operation principle and the parameters of the emission of a helium-neon laser.	4									5			PRM 1-5, SUP1-4	IR 1-3	
			Self-guided work		2											PRM 1-5, SUP1-4	IR 1-3	
7-13		РД1-3	**Module 2. Coherent and incoherent light sources**															
7			Lecture 4. Objects of laser exposure.	2												PRM 1-5, SUP1-4		
			Self-guided work		2											PRM 1-5, SUP1-4		
8			Laboratory work No 4: Solid-state laser and second harmonic generation.	4									5			PRM 1-5, SUP1-4	IR 1-3	
			Self-guided work		2											PRM 1-5, SUP1-4	IR 1-3	
9			Conference week 1															
			Test on the module 1		5						5							
			Topic for the Forum		5						5							
			Tutorial	2	2													
			Total for the first control point	24							15		20	**35**				
10			Lecture 5. Lasers for biology and medicine. Laser surgery and therapy.	2												PRM 1-5, SUP1-4		
			Practice 1: Calculation of the radiation power incident on the object for given values of beam divergence and attenuation coefficient on the atmospheric path of a given length.	2												PRM 1-5, SUP1-4	IR 1-3	

Week	Date	Results	Types of activity	Hours		Assessment								Points	Technology of classes	References		
				Classes	Self-Guided Work	Essay	Talk	Practice Defending	Control Work	Individual work	Test	Presentation	Lab defendi			Literature	Web	Multimedia
			Self-guided work		2											PRM 1-5, SUP1-4	IR 1-3	
11			Laboratory work No 5: Measuring of laser beam parameters.	4									5			PRM 1-5, SUP1-4	IR 1-3	
			Self-guided work		2											IR1, IR2	IR 1-3	
12			Lecture 6. Incoherent radiation sources.	2												PRM 1-5, SUP1-4	IR 1-3	
			Practice 2: Calculation of radiation dose for low-intensity therapy.	2												PRM 1-5, SUP1-4	IR 1-3	
			Self-guided work		2											PRM 1-5, SUP1-4		
13			Practice 3: Calculation of the laser efficiency. Measuring the divergence of laser radiation.	2												PRM 1-5, SUP1-4	IR 1-3	
			Self-guided work		2											PRM 1-5, SUP1-4	IR 1-3	
14-17		**РД1-3**	**Module 3. Optical methods for studying biological tissues and bioliquids**															
14			Lecture 7. Optical Microscopy. Optical Tomography	2												PRM 1-5, SUP1-4		
			Self-guided work		2											PRM 1-5, SUP1-4		
15			Laboratory work No 6: Laser monitor	4									5			PRM 1-5, SUP1-4		
			Self-guided work		2											PRM 1-5, SUP1-4	IR 1-3	
16			Lecture 8. Electronic speckle pattern interferometry. Monitoring of hidden objects.	2												PRM 1-5, SUP1-4		
			Self-guided work		2											PRM 1-5, SUP1-4		
17			Practice 4: Calculation of the emission wavelengths of higher-order harmonics for laser radiation.	2												PRM 1-5, SUP1-4	IR1, IR2	
			Self-guided work		2											PRM 1-5, SUP1-4	IR1, IR2	
18			Conference week 1															
			Seminar. Coherent methods of optical diagnostics.		10		5											
			Test on the module 2								5							
			Test on the module 3								5							
			Total for the second control point	24			5				10		10	**60**				
			Exam											**40**				
			Total on the Discipline	48	60	-	10		20	-	-	-	30	**100**				

Information Support:

№ (code)	Primary literature (PRM)
PRM 1	Hooker S., Webb C. Laser Physics. – Oxford: Oxford University Press, 2010. – 648 p.
PRM 2	Nonlinear Optical Systems. Principles, Phenomena, and Advanced Signal Processing / edited by L.N. Binh, D.V. Liet. – New York: Taylor & Francis CRC Press, 2012. – 451 p.
PRM 3	Biomedical Imaging: applications and advances [Electronic resource] / ed. P. Morris. – Amsterdam: Elsevier, 2014. Excess: http://www.lib.tpu.ru/fulltext2/m/2015/science_book/Biomedical_Imaging.pdf
PRM 4	Laser Focus World. Periodical Journal. USA
PRM 5	Quantum and Optical Electronics / G.S. Evtushenko, F.A. Gubarev; Tomsk Polytechnic University. – Tomsk, TPU Publishing House, 2011.
PRM 6	Biomedical Photonics. Handbook / Editor-in-Chief Tuan Vo-Dinh. – CRC Press, 2003. – 1787 p.
№ (code)	Supplementary literature (SUP)
SUP 1	Choe R. Diffuse optical tomography and spectroscopy of breast cancer and fetal brain. A dissertation in Physics and Astronomy. – University of Pennsylvania, 2005. – 248 p.
SUP 2	Fundamentals of Physics (10 ed.) / edited by J. Walker, – Wiley, 2014. – 1450 p.
SUP 3	Ian M. Watt. The Principles and Practice of Electron Microscopy (2 ed.). – Cambridge University Press, 1997. – 500 p.
SUP 4	Sokal, Robert. Biometry. The Principles and Practice of Statistics in Biological Reseach / R. R. Sokal, J. Rohlf. - 4th ed. - New York: W. H. Freeman and Company, 2012. - 937 p.

№ (code)	Internet Resource (IR)	Address
IR 1	E-learning course “Optical Methods in Biology and Medicine” by Gubarev F.A.	http://design.lms.tpu.ru/course/view.php?id=1951
IR 2	Personal web site of prof. Gennadiy S. Evtushenko	http://portal.tpu.ru/SHARED/e/EVT
IR 3	Personal web site of A/prof. Fedor A. Gubarev	http://portal.tpu.ru/SHARED/g/GFADDTPU