RTU Course "Physics"

32000 null

General data

Code	MFB107
Course title	Physics
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Juris Blūms
Academic staff	Igors Klemenoks Gita Rēvalde Juris Blūms Santa Rekšņa Artis Linarts Artūrs Vrubļevskis Kaspars Ozols Astrīda Bērziņa Vladimirs Miglāns
Volume of the course: parts and credits points	2 parts, 12.0 credits
Language of instruction	LV, EN
Annotation	Physics is closely related to the natural sciences, leads to the new multidisciplinary research directions - biophysics, material science, physical chemistry. Physics is also the basis for engineering. Directly from the development of physics the technical level of production is dependent on. All this points to the fact that the study course at the technical universities have a special meaning. The study course for engineers is a fundamental theoretical training base, without which the further success of the engineer is not possible. The study course of study based on the school of mathematics provides the theoretical basic knowledge of mechanics, molecular physics and thermodynamics, electromagnetism, wave and quantum optics, quantum mechanics, solid state physics, atomic physics, nuclear, and particle physics. In the frame of the study course, practical skills of solving methods as well as experimental work skills and the experimental results of mathematical processing basics are acquired. The study course consists of lectures, laboratory work and classes for solutions to practical problems.
Goals and objectives of the course in terms of competences and skills	The goal of the study course is to master the theoretical knowledge and practical skills in physics at university, using elements of higher mathematics as well as to develop physical and technical perception and logical thinking. The objectives of the study course: - to develop the skills to orientate in classical physics and the latest achievements in physics and their applications in solving various technical problems, including high value-added technologies; - to develop the skills to see the connection between the theory of physics and practice, as well as the ability to solve relatively simple problems in physics; - to develop the skills to perform physics experiments, mathematically process the results of experiments, analyse the results and draw conclusions.
Structure and tasks of independent studies	Independent study of textbooks and solution of the practical exercises. The preparation of the theoretical introduction for each laboratory work, the mathematical processing of the laboratory work and concluding reports preparation.
Recommended literature	Obligātā/Obligatory: 1. Fizikas un tehnikas vēstures lappuses: atskats divdesmitajā gadsimtā . Valdis Rēvalds, Gita Rēvalde. Rīga: "Sava grāmata", 2020. 587 lpp. 2. Bauer,W., Westfall, G.D. University Physics with Modern Physics. Second edition,USA, Mc Graw Hill International Edition, 2014. 1298 p. 3. Fizika. Red. A.Valters. Rīga: Zvaigzne, 1992. 643 lpp. 4. Fizikas praktikums tehniskās universitātes studentiem. M. Jansone, I. Klincāre, A. Ķiploka u.c. Rīga: RTU, 2003. 172 lpp. 5. Uzdevumu krājums vispārīgajā fizikā. Red. A. Ozols. Rīga: RTU, 2006. 273 lpp. Papildu/Additional: 1. Apinis, A. Fizika. Rīga: Zvaigzne, 1972. 706 lpp. 2. Grabovskis, R. Fizika. Rīga: Zvaigzne, 1983. 645 lpp. 3. Hugh D. Young, Roger A. Freedman. University Physics. USA, QC21.2Y67, 2000, 1513 p. 4. Halliday, D., Resnick, R., Walker, J. Fundamental of physics. 8th ed., USA, QC21.3H35, 2008, 1334 p. 5. Volkenšteine, V. Uzdevumu krājums fizikā. Rīga: Zvaigzne, 1968. 353 lpp. 6. Fizikas uzdevumu risināšana. Red. A.Valters. Rīga: Zvaigzne, 1982. 175 lpp. 7. Novērojumu un mērījumu rezultātu matemātiskās apstrādes pamati: metodiski norādījumi laboratorijas darbu veikšanai. Sast. A.Valters, N. Zagorska. Rīga: RTU, 1991. 25 lpp. 8. Uzdevumu krājums vispārīgajā fizikā. M. Jansone, A. Kalnača, J. Blūms u.c. Rīga: RTU, 2000, 247 lpp. 9. Fizikas praktikums tehniskās universitātes studentiem. I. Klincāre, M. Jansone, A. Ķiploka u.c. Rīga: RTU, 2001,189 lpp.
Course prerequisites	Physics, chemistry and mathematics in secondary school level, elements of higher mathematics.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Introduction to the material point and an absolutely rigid body kinematics.	10	16	6	28
Dynamics of material point.	6	10	3	16
Rigid body dynamics.	20	30	9	40
Mechanical oscillations.	16	16	5	26
Mechanical waves.	6	6	2	12
Thermodynamic systems. Ideal gas. The physical basics of molecular kinetic theory.	6	10	3	16
Transfer processes.	6	6	2	12
Basics of thermodynamics.	6	6	2	12
Test (theory).	4	0	0	0
Test (practical problems).	8	0	0	0
Laboratories.	40	20	16	30
Solution of practical problems.	32	40	16	64
Total:	160	160	64	256

Learning outcomes and assessment

Learning outcomes	Assessment methods
Able to navigate the classical physics topics and issues, as well as the latest achievements of physics.	Test types: tests, written exam. Criteria: able to freely navigate different types of physical regularities.
Able to independently solve the problems of classical physics-standard tasks, the use of higher mathematics.	Test types: tests, written exam. Criteria: able to formulate and analyze a physical problem and to take on specific numerical estimates.
Able to independently carry out physics experiments, and to do the mathematical treatment of the obtained results.	Test types: test lab work. Criteria: able to process and quantitatively analyze the experimental results.
Able to discern the laws of physics applications in different engineering applications and their implementation in nature and everyday life.	Test types: tests, written exam. Criteria: able to explain the physics related to natural phenomena and engineering principles for the physical operation of devices.

Evaluation criteria of study results

Criterion	%
Laboratory works	25
Tests	25
Exam	50
Total:	100

Study subject structure

Part	CP	Hours			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	6.0	2.0	1.0	1.0		*	
2.	6.0	2.0	1.0	1.0		*	