KAUNAS UNIVERSITY OF TECHNOLOGY

STUDY MODULE PROGRAMME (SMP)

Module Code	T	150	B	021	Accredited until	2025	09	01	Renewal date		
	Branch of Science		Progr.	Registr. №.							

Entitlement

Nanostructures and Nanomaterials

Prerequisites

Basics of the physics and mathematics

Main aim

To teach the basic knowledge about nanostructures and its applications for different nanotechnology applications

Course (module) Learning Outcomes

№.	Outcomes	Teaching / Learning Methods	Assessment Methods
1	Know and understand classification of the one-, two- and three dimensional nanostructures	Laboratory classes, Lecture	Colloquium (interview led by lecturer and / or specialist), Laboratory examination
2	Know and understand self-organization of nanostructure	Lecture	Colloquium (interview led by lecturer and / or specialist)
3	Know and understand about nanoparticles	Lecture	Colloquium (interview led by lecturer and / or specialist)
4	Know and understand nanoporous materials.	Lecture	Colloquium (interview led by lecturer and / or specialist)
5	Know and understand nanotubes.	Lecture	Written examination
6	Know and understand nanodevices	Lecture, Seminar	Laboratory examination
7	Know and understand nanosensors	Laboratory classes, Lecture	Laboratory examination
8	Know and understand nanoelectronics	Lecture	Written examination

Summary

In this course classification of the nanomaterials and nanostructures is explained. One-, two- and three dimensional nanostructures are described. Principles of the self-organization of nanostructures are explained. Different nanoparticles are explained. Nanoporous materials are described. Knowledge about the nanotubes is aquired. Main principles and types of the nanodevices are explained. Knowledge about the nanosensors and nanoelectronics is aquired.

Level of module

Level of programme		Subject group
Cycle	Degree	
First	Bachelor	Special Subjects

Syllabus

№.	Sections and themes
1.	One-, two- and three dimensional nanostructures
2.	Self-organization of nanostructures
3.	Nanoparticles
4.	Nanoporous materials
5.	Nanotubes
6.	Nanodevices
7.	Nanosensors
8.	Nanoelectronics

Evaluation procedure of knowledge and abilities:

The ten-grade scale and the cumulative evaluation system are applied. The module's final evaluation consists of the sum of multiplications of the grades of the intermediate assessments and the final assessment multiplied by weighting coefficients (percentage components).

References

№.	Title	Edition in KTU library		In KTU bookstore	Number of ex. in the methodical cabinet of the depart.
		Pressmark	Number of exemplars		
1.	Jonas Vilys, Sigitas Tamulevičius, Viktoras Grigaliūnas, Šarūnas Meškinis, Asta Guobienė. Paviršiaus inžinerija ir nanotechnologijos. Mokomoji knyga. Kaunas: Vitae Litera, 2007. 225 psl.	D198358	16	Yes	
	Comment:Available at ebooks.ktu.lt				
2.	Bhushan, Bharat. Springer handbook of nanotechnology, Berlin :Springer Science+Business Media, 2007.			No	
	Comment:E-book				
3.	William D. Calhslev. Fundamentals of Materials Science and Engineering.- An interactive e-text, John Wiley&Sons, Inc., N. Y. 2001.	E32307	1	No	
4.	Gatzen, Hans-Heinrich. Micro and nano fabrication : tools and processes (2015)	D215105	1	No	
5.	Ramsden, Jeremy. Nanotechnology: an introduction (2011)	D205533		No	
6.	Bohidar, Himadri Design of nanostructures : self-assembly of nanomaterials (2017)	D215754	1	No	
7.	meno, Yoshitaka Multiphysics in nanostructures (2017)	D215829	1	No	
8.	Nanostructures, nanomaterials, and nanotechnologies to nanoindustry (2015)	D212532	1	No	
9.	Durkan, Colm. Current at the nanoscale : an introduction to nanoelectronics (2014)	D213687	1	No	
10.	https://moodle.ktu.edu/course/view.php?id=1683			No	

Additional literature

№.	Title
1.	Bakhoum, Ezzat G. Micro- and nano-scale sensors and transducers (2015) 681.586:620.1-181.48 Informatikos f. b-ka(1/ 0) D213918
2.	Nanostructures, nanomaterials, and nanotechnologies to nanoindustry (2015) 620.3 (062.534) Cheminės technolog. f. b-ka(1/ 0) D212532
3.	Durkan, Colm. Current at the nanoscale : an introduction to nanoelectronics (2014) 621.38.049.77 Informatikos f. b-ka(1/ 0) D213687
4.	Advanced nanoelectronics (2013) 621.38.049.77 Informatikos f. b-ka(1/ 0) D209428

Lecturer

	Position	Name, surname
Coordinating	General Research Assistant	Šarūnas MEŠKINIS

Subdivision

	Entitlement	Code	Contribution, %
Atsakingas padalinys	Institute of Materials Science	70	100

Languages of instruction

Spring semester:	Lithuanian

Teaching form

№.	Mode of studies	Semester	Structure					Total hours	Credits
			Lectures	Practical (supervised)	Laboratory (supervised)	Tutorial	Independent Learning		

1	Standard	A	S	32	0	16	0	112	160	6

Teaching form Standard

Schedule of individual work tasks and their influence on final grade

Assessment form	Final Assessment	№. of syllabus	Total hours	Influence on grade, %	Week of presentment of task (*) and reporting (o)															
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17-20
Colloquium (interview led by lecturer and / or specialist)		1-4	40	45	*									0							
Laboratory examination		1,6,7	32	10	*															0	
Written examination	√	5-8	40	45	*																0
Total:	-	-	112	100																	

Assessment criteria and connection to the study module's study results

Assessment form	Assessment week	Assessment criteria	Course (module) Learning Outcomes
Colloquium (interview led by lecturer and / or specialist)	10	• 1. Each colloquium question is evaluated on a 10-point scale. If nothing is answered - 0. • 2. The average grade of all exam questions is derived and the final colloquium grade is derived accordingly. • 3. The colloquium is counted if the final grade is 5 or more.	• Know and understand about nanoparticles • Know and understand classification of the one-, two- and three dimensional nanostructures • Know and understand nanoporous materials. • Know and understand self-organization of nanostructure
Laboratory examination	16	• 1. Preparation for laboratory work. • 2. Analysis of the obtained results and comparison with the theoretical material. • 3. Formulation and justification of conclusions. • 4. Presentation of the results of the graphic part. • 5. Reliability of results.	• Know and understand classification of the one-, two- and three dimensional nanostructures • Know and understand nanodevices • Know and understand nanosensors
Written examination	17	• 1. Each exam question is evaluated on a 10-point scale. If nothing is answered - 0. • 2. The average grade of all exam questions is derived and the final exam grade is derived accordingly. • 3. The exam is credited if the final grade is 5 or more.	• Know and understand nanoelectronics • Know and understand nanotubes.