



İZMİR UNIVERSITY OF ECONOMICS

Faculty of Arts and Sciences  
Physics

PHYS 411 - Nanoscience and Nanotechnology

COURSE INTRODUCTION AND APPLICATION INFORMATION

Course Name	Nanoscience and Nanotechnology
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Code	Semester	Theory (hour/week)	Application/Laboratory (hour/week)	Local Credits	ECTS
PHYS 411	Fall/Spring	2	2	3	5

Prerequisites	None
Course Language	English
Course Type	Elective
Course Level	First Cycle
Mode of Delivery	Online
	* Discussion * Problem Solving * Lecture / Presentation
Course Coordinator	-
Course Lecturer(s)	* <u>Prof. Dr. Gürsoy Bozkurt AKGÜÇ</u>
Course Assistants	* <u>Araş. Gör. Hülya KARAASLAN</u>

Course Objectives	The main aim of this course is to investigate nanomaterials, learn how they are grown, discuss different methods to characterize them and evaluate the wide spectrum of their applications.
Course Learning Outcomes	The students who succeeded in this course; * classify properties specific to nanomaterials. * explain the production methods of nanomaterials. * discuss the applications of nanomaterials.

	<ul style="list-style-type: none"> <li>* compare various tools to characterize nanomaterials.</li> <li>* discuss new nano structures with high potential for applications.</li> </ul>
<b>Course Description</b>	Nanomaterials, their production, characterization, applications and types of them with high application potentials will be examined in detail.

<b>Course Category</b>	Core Courses	
	Major Area Courses	X
	Supportive Courses	
	Media and Management Skills Courses	
	Transferable Skill Courses	

## WEEKLY SUBJECTS AND RELATED PREPARATION STUDIES

Week16	Subjects	Related Materials
1	Nanomaterials, history, scope	B.S. Murty, P. Shankar, B. Raj, B. B. Rath, J. Murday, Textbook of Nanoscience and Nanotechnology, 2013 edn. (Springer, 2016). Chapter 1. ISBN: 9783662509128
2	Properties specific to nanomaterials	B.S. Murty, P. Shankar, B. Raj, B. B. Rath, J. Murday, Textbook of Nanoscience and Nanotechnology, 2013 edn. (Springer, 2016). Chapter 2. ISBN: 9783662509128
3	Production methods: bottom-up approach	B.S. Murty, P. Shankar, B. Raj, B. B. Rath, J. Murday, Textbook of Nanoscience and Nanotechnology, 2013 edn. (Springer, 2016). Chapter 3.1. ISBN: 9783662509128
4	Production methods: top to bottom approach	B.S. Murty, P. Shankar, B. Raj, B. B. Rath, J. Murday, Textbook of Nanoscience and Nanotechnology, 2013 edn. (Springer, 2016). Chapter 3.2.

5	Nanoelectronic applications, MEMS	B.S. Murty, P. Shankar, B. Raj, B. B.
		Rath, J. Murday, Textbook of
		Nanoscience and Nanotechnology, 2013

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6	Food technology, sensors applications	B.S. Murty, P. Shankar, B. Raj, B. B. Rath, J. Murday, Textbook of Nanoscience and Nanotechnology, 2013 edn. (Springer, 2016). Chapter 4.3-5. ISBN: 9783662509128
7	Midterm exam 1	
8	Energy and other applications	B.S. Murty, P. Shankar, B. Raj, B. B. Rath, J. Murday, Textbook of Nanoscience and Nanotechnology, 2013 edn. (Springer, 2016). Chapter 4.13-15. ISBN: 9783662509128
9	Methods to characterize nanomaterials: XRD, SAX, SEM	B.S. Murty, P. Shankar, B. Raj, B. B. Rath, J. Murday, Textbook of Nanoscience and Nanotechnology, 2013 edn. (Springer, 2016). Chapter 5.1-3. ISBN: 9783662509128
10	Microscopic tools: TEM, AFM, STM, FIM, 3DAP	B.S. Murty, P. Shankar, B. Raj, B. B. Rath, J. Murday, Textbook of Nanoscience and Nanotechnology, 2013 edn. (Springer, 2016). Chapter 5.4-8. ISBN: 9783662509128
11	Nanomaterials with high potential to applications, quantum dots, carbon nanotubes	B.S. Murty, P. Shankar, B. Raj, B. B. Rath, J. Murday, Textbook of Nanoscience and Nanotechnology, 2013 edn. (Springer, 2016). Chapter 6.1-2. ISBN: 9783662509128
12	GaN nanowires, nanocrystal ZNO, Midterm exam 2	B.S. Murty, P. Shankar, B. Raj, B. B. Rath, J. Murday, Textbook of Nanoscience and Nanotechnology, 2013 edn. (Springer, 2016). Chapter 6.3-4. ISBN: 9783662509128
13	Nanocrystal titanium oxide, multi layered membranes	B.S. Murty, P. Shankar, B. Raj, B. B. Rath, J. Murday, Textbook of Nanoscience and Nanotechnology, 2013

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<b>14</b>	Problems and challenges of nanotechnology	B.S. Murty, P. Shankar, B. Raj, B. B. Rath, J. Murday, Textbook of Nanoscience and Nanotechnology, 2013 edn. (Springer, 2016). Chapter 7. ISBN: 9783662509128
<b>15</b>	Semester review	
<b>16</b>	Final exam	

## SOURCES

<b>Course Notes / Textbooks</b>	B.S. Murty, P. Shankar, B. Raj, B. B. Rath, J. Murday, Textbook of Nanoscience and Nanotechnology, 2013 edn. (Springer, 2016). ISBN: 9783662509128
<b>Suggested Readings/Materials</b>	Chriss Binns, Introduction to Nanoscience and Nanotechnology (Wiley, 2010). ISBN: 9780471776475

## EVALUATION SYSTEM

Semester Activities	Number	Percentage of Grade
Participation	1	10
Laboratory / Application	-	-
Field Work	-	-
Quiz/Studio Critic	-	-
Portfoilo	-	-
Homework Assignment	1	10
Presentation/Jury	-	-
Project	-	-
Seminar/Workshop	-	-
Oral Exam	-	-
Midterm	2	40
Final	1	40
<b>Total</b>	<b>5</b>	<b>100</b>

<b>WEIGHTING OF SEMESTER ACTIVITIES ON THE FINAL GRADE</b>	<b>4</b>	<b>60</b>
<b>WEIGHTING OF END-OF-SEMESTER ACTIVITIES ON THE FINAL GRADE</b>	<b>1</b>	<b>40</b>
<b>Total</b>	<b>5</b>	<b>100</b>



## ECTS / WORKLOAD TABLE

Semester Activities	Number	Duration (Hours)	Total Workload
Course Hours (Including Exam Week: 16 x Total Hours)	16	2	32
Laboratory / Application Hours	16	2	32
Study Hours Out of Class	12	3	36
Field Work	-	-	-
Quiz / Studio Critique	-	-	-
Portfolio	-	-	-
Homework / Assignment	1	2	2
Presentation / Jury	-	-	-
Project	-	-	-
Seminar / Workshop	-	-	-
Oral Exam	-	-	-
Midterm	2	10	20
Final	1	20	20
		<b>Total Workload</b>	<b>150</b>

## THE RELATIONSHIP BETWEEN COURSE LEARNING OUTCOMES AND PROGRAM QUALIFICATIONS

#	Program Qualifications / Outcomes	* Level of Contribution				
		1	2	3	4	5
1	To be able master and use fundamental phenomenological and applied physical laws and applications,				X	
2	To be able to identify the problems, analyze them and produce solutions based on scientific method,					X
3	To be able to collect necessary knowledge, able to model and self-improve in almost any area where physics is applicable and able to criticize and reestablish his/her developed models and solutions,			X		
4	To be able to communicate his/her theoretical and technical knowledge both in detail to the experts and in a simple and understandable manner to the non-experts comfortably,					
5	To be familiar with software used in area of physics extensively and able to actively use at least one of the advanced level programs in European Computer Usage License,					
6	To be able to develop and apply projects in accordance with sensitivities of society and behave according to societies, scientific and ethical values in every stage of the project that he/she is part in,					
7	To be able to evaluate every all stages effectively bestowed with universal knowledge and consciousness and has the necessary consciousness in the subject of quality governance,					
8	To be able to master abstract ideas, to be able to connect with concrete events and carry out solutions, devising experiments and collecting data, to be able to analyze and comment the results,					
9	To be able to refresh his/her gained knowledge and capabilities lifelong, have the consciousness to learn in his/her whole life,					
10	To be able to conduct a study both solo and in a group, to be effective actively in every all stages of independent study, join in decision making stage, able to plan and conduct using time effectively.					
11	To be able to collect data in the areas of Physics and communicate with colleagues in a foreign language ("European Language Portfolio Global Scale", Level B1).					
12	To be able to speak a second foreign at a medium level of fluency efficiently					
13	To be able to relate the knowledge accumulated throughout the human history to their field of expertise.					

\*1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest