BALIKESIR UNIVERSITY
NECATİBEY EDUCATION FACULTY
UNIVERSITY ELECTIVE COURSE PROPOSAL FORM

Department/Program	Mathematics and Science Education/Chemistry Education	
Course unit title	Nanoscience and nanotechnology	
Semester	Fall	
Language of instruction	Turkish	
Credit	2	
Number of ECTS credits	3	
Mode of delivery	Face to face	
Objectives of the course	To help students understand the differences among nanoscale, microscale and macroscale, to understand the importance of nanoscience, to show the application areas of nanotechnology and to draw attention to its risks.	
Course content	A brief history of nanoscience, Size and scale, Characterization of materials at nanoscale, The ratio of surface area to volume, Size-dependent properties, Electron microscopes, Probe microscopes, Application areas of nanoscience, Nanostructures in nature and nanotechnological products	
Prerequisites and co-requisities	Having General Chemistry I-II (P1-P2), General Physics I-II (P3-P4), General Mathematics I-II (P5-P6)courses.	
Name of lecturer	Doç. Dr. RuhanBenlikaya	e-mail: ruhan@balikesir.edu.tr
Assistants		e-mail:
Internship	---	
Resources	R1: Baykara, T., vd. 2010. Nanoteknolojive Nano-MalzemeSüreçleri. TÜBİTAK Mam MalzemeEnstitüsü. Ankara. R2:KöksalFevzi, KöseoğluRahmi, 2014, NanobilimveNanoteknoloji, Nobel AkademikYayıncılık R3: Edward L Wolf, ManasaMedikonda, 2016, NanoteknolojiDevriminiAnlamak, Nobel AkademikYayıncılık. R4: Jeremy Ramsden, NanoteknolojininEsasları, 2014, ODTÜ GeliştirmeVakfıYayıncılık R5:TarıkBaykara, 2016, NanoteknolojilerDünyasınaDoğru, Nobel AkademikYayıncılık R6:Erkoç, Ş., 2010, NanobilimveNanoteknoloji, ODTÜ Yayıncılık	
Type of course unit	Elective	
Planning learning activities and teaching methods	Active learning based activities, group discussion, class discussion, laboratory work, material preparation	

Assestment methods and criteria			ECTS allocated based on student workload			
In-term studies	Quantitiy	Percentage (%)	Activities	Quantity	Duration	Total work load (hours)
Mid-terms	1	30	Course duration	14	3	42
Quizzes			Hours for off-the-c.r.stud	14	3	42
Assignment	3	30	Mid-terms	1	2	2
Attendance	14	10	Final exams	1	2	2
Practice			Total work load (hours): 88			
Project			Number of ECTS credits: 3			
Final exam	1	30				

Students will be able
-to understand the differences among nanoscale,microscale and macroscale.
-to explain size-dependent properties
-to explain how electron and probe microscopes works.
-to explain how the microscopes are used in characterization of nanomaterials.
-to explain the contribution of the nanostructures in nature to development of nanotechnology.

Weeks	Topics	Prerequisites	Resources
1	A brief history of nanoscience, size and scale	--	--
2	The differences among nanoscale,microscale and macroscale.	--	--
3	The ratio of surface area to volume, surface area and interactions	--	R2, R5, R6 P5
4	Size dependent properties (Physical properties)	Studying on given questions about concepts such as conductor, conductivity and semiconductor concepts and quantum dots	P1-4, R2, R6
5	Size dependent properties (Chemical properties)	Studying on given questions about concepts such as hydrophobicity and hydrophilicity	P1, P2,
6	Size dependent properties (Magnetic properties, mechanical	Studying on given questions about concepts such as magnetism, diamagnetism and	P1-4

	properties)	ferromagnetism	
7	Mid-term exam		
8	Preparation of nanomaterials	--	--
9	Characterization of nanomaterials	--	R1-6
10	Nanostructures in nature	--	R1-6
11	Application areas of nanotechnology	Preparation for examples in application areas	R1-6
12	Application areas of nanotechnology	--	R1-6
13	Risks of nanotechnology	--	R1, R3, R5
14	Final exam		

Contribution of learning outcomes to	To relate chemistry to other sciences such as physics and biology. To perform interdisciplinary and interdisciplinary team work. Science literacy. Nanoliteracy. Critical thinking skills. To interpret scientific data and draw conclusions.