Introduction to Nanoscience and Nanotechnology

Course Code	Course Name		Semester	
NE 211	Introduction to Nanoscience and Nanotechnology		Fall ☒ Spring ☐ Summer ☐	
Hours			**Credit**	**ECTS**
Theory	**Practice**	**Lab**	3	4
3	0	0		

Course Details	
Department	
Course Language	English
Course Level	Undergraduate ☒ Graduate ☐
Mode of Delivery	Face to Face ☒ Online ☐ Hybrid ☐
Course Type	Compulsory ☐ Elective ☒
Course Objectives	Students should understand the fundamental concepts of Nanoscience and Nanotechnology, learn key synthesis and characterization methods, analyze the properties and behavior of materials at the nanoscale. In addition, this course focuses on examining the development and applications of nanoscale biomaterial.
Course Content	This course introduces students to the fundamental principles of Nanoscience and Nanotechnology. Topics include the unique properties of nanomaterials, synthesis and characterization techniques, and real-world applications across electronics, medicine, and energy. The ethical, environmental, and societal aspects of nanotechnology will also be discussed.
Course Method/ Techniques	Lecture ☒ Question & Answer ☒ Presentation ☒ Discussion ☒
Prerequisites/ Corequisites	
Work Placement(s)	

Textbook/References/Materials

- A. Nouailhat, "An Introduction to Nanoscience and Nanotechnology", Wiley (2008)
- Gabor L. Hornyak, H.F. Tibbals, Joydeep Dutta, John J. Moore , "An Introduction to Nanoscience and Nanotechnology", Wiley (2008)
- Gabor L. Hornyak, H.F. Tibbals, Joydeep Dutta, H.F.Tibbals, Anil Rao. "Introduction to Nanoscience",Taylor and Francis
- Chris Binns, INTRODUCTION TO NANOSCIENCE AND NANOTECHNOLOGY, Wiley (2010)
- C. Brechignac, P. Houdy, M. Lahmani "Nanoscience: Nanotechnologies and Nanophysics" by (Springer)

OSTİM TEKNİK ÜNİVERSİTESİ ANKARA	FACULTY OF ENGINEERING COURSE SYLLABUS FORM	Doküman Kodu	MF.FR.003
		Yayın Tarihi	06.09.2024
		Revizyon No	0
		Revizyon Tarihi	0
		Gizlilik Sınıfı	Hizmet içi

Course Category				
Mathematics and Basic Sciences	☐		Education	☐
Engineering	☒		Science	☐
Engineering Design	☐		Health	☐
Social Sciences	☐		Profession	☒

Weekly Schedule		
No	**Topics**	**Materials/Notes**
1	Introduction to Nanoscience & Nanotechnology: Definitions, Scope	Hornyak Ch.1
2	Nanoscale Properties: Physical, Chemical, Optical, Magnetic	Hornyak Ch.2, 6
3	Quantum Effects and Surface-to-Volume Ratio	Hornyak Ch.3
4	Synthesis I: Top-Down Approaches	Hornyak Ch.5
5	Synthesis II: Bottom-Up Approaches	Hornyak Ch.5, 8
6	Nanomaterials: Nanoparticles, CNTs, Nanowires, QDs	Hornyak Ch.4, 9
7	Characterization I: SEM, TEM	Hornyak Ch.7
8	Midterm Exam Week	
9	Characterization II: AFM, XRD, Spectroscopy	Hornyak Ch.7
10	Carbon Nanomaterials: Fullerenes, CNTs, Graphene	Brechignac Ch.6
11	Applications: Nanoelectronics and Photonics	Hornyak Ch.10
12	Applications: Nanomedicine and Biotechnology	Hornyak Ch.11
13	Environmental and Toxicological Aspects	Hornyak Ch.12
14	Ethics, Safety, and Regulatory Aspects	Hornyak Ch.13
15	Future Trends: Nanorobotics, AI-Nano, Quantum Nanotech	Online Articles
16	Final Exam Week	

Assessment Methods and Criteria		
In-term studies	**Quantity**	**Percentage**
Attendance	10	5%
Lab		
Practice		
Fieldwork		
Course-specific internship		
Quiz/Studio/Criticize		
Homework	1	15%
Presentation / Seminar	1	10%
Project		
Report		
Seminar		
Midterm Exam	1	20%
Final Exam	1	50%
	Total	**100%**
Contribution of Midterm Studies to Success Grade		50%
Contribution of End of Semester Studies to Success Grade		50%
	Total	**100%**

ECTS Allocated Based on Student Workload			
Activities	**Quantity**	**Duration (Hrs)**	**Total Workload**
Course Hours	16	3	48
Lab			
Practice			
Fieldwork			
Course-specific Work Placement			
Out-of-class study time	16	2	32
Quiz/Studio/Criticize			
Homework	2	2	4
Presentation / Seminar	1	2	2
Project			
Report			
Midterm Exam and Preparation for Midterm	1	15	15
Final Exam and Preparation for Final Exam	1	15	15
Total Workload			116
Total Workload / 25			
ECTS Credit			**(116/30 = 3.8)**

Course Learning Outcomes	
No	**Outcome**
L1	Describe nanoscale phenomena and their distinction from bulk properties.
L2	Identify key nanomaterials and summarize their unique characteristics.
L3	Explain major synthesis and fabrication techniques for nanomaterials.
L4	Apply fundamental characterization techniques to analyze nanostructures.
L5	Evaluate the societal and environmental impacts of nanotechnology.
L6	Discuss modern applications and future trends in nanotechnology.
L7	Developing a positive attitude towards lifelong learning and constantly renewing professional knowledge and skills
L8	Having sufficient awareness on universality of social rights, social justice, quality culture and protection of cultural values, environmental protection, occupational health and safety.

Contribution of Course Learning Outcomes to Program Competencies/Outcomes

Contribution Level: 1: Very Slight, 2: Slight, 3: Moderate, 4: Significant, 5: Very Significant

	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**	**Total**
L1	2	3	2	1	3	1	3	3	4	1	2	
L2	2	3	5	1	3	2	3	4	4	2	3	
L3	2	4	5	1	3	2	3	4	3	3	4	
L4	2	1	1	3	1	1	1	1	1	1	1	
L5	2	3	3	1	5	2	1	3	1	3	3	
L6	3	2	1	1	1	1	1	1	1	3	3	
L7	1	1	1	3	2	1	1	1	1	2	1	
L8	1	1	1	1	2	1	1	3	1	1	2	
											Total	