COURSE INFORMATON					
Course Title	*Code*	*Semester*	*L+P Hour*	*Credits*	*ECTS*
NANOMATERIALS: CHARACTERIZATION AND APPLICATIONS	**CHBE 567**	**1 or 2**	**3**	**3**	**10**

Prerequisites	-

Language of Instruction	English
Course Level	Master's Degree
Course Type	Elective
Course Coordinator	
Instructors	Assist. Prof. Cem Levent Altan
Assistants	
Goals	The aim of this course is to give fundamental information about chemical and physical properties of nanomaterials, various synthesis methods and characterizaton techniques of different nano-sized structures and their applications.
Content	Introduction to Nanotechnology, Physical and Chemical Properties of Nanomaterials, Nanofluids, Synthesis of Nanoparticles, Characterization of Nanomaterials, Applications of Nanomaterials

Course Learning Outcomes	**Program Learning Outcomes**	**Teaching Methods**	**Assessment Methods**
1) Adequate knowledge in nanomaterials and their properties and applications; ability to use theoretical and applied information in these areas to solve relevant problems.	1	1,2,4	A,B
2) Ability to devise, select, and use modern techniques such as XRD, UV-VIS, FTIR, DLS and zeta potential measurement, TEM, VSM etc needed for engineering practice	2	1,2,3,4	A,B
3) Ability to communicate effectively both orally and in writing by following the text book writing project reports and exams in English.	8	1,2,4	A,B
4) Recognition of the need for lifelong learning; ability to access information, to follow developments in nanmaterials and in nanotechnology, and to continue to educate him/herself on these topics.	3	1,2,4	A,B

5) Knowledge about nanotechnology and the global and societal effects of nanotechnology on health, environment, and safety.	10	1,2	A,B

Teaching Methods:	1: Lecture, 2: Question-Answer, 3: Laboratory 4: Case Study
Assessment Methods:	A: Testing, B: Homework or Project

COURSE CONTENT

Week	Topics	Study Materials
1	INTRODUCTION TO NANOTECHNOLOGY AND NANOMATERIALS	Textbook
2	PHYSICAL AND CHEMICAL PROPERTIES OF NANOMATERIALS	Textbook
3	NANOFLUIDS (BASE FLUIDS, NANOPARTICLES, SURFACTANTS)	Textbook
4	COLLOIDAL STABILITY	Textbook
5	SYNTHESIS OF NANOPARTICLES 1	Textbook
6	SYNTHESIS OF NANOPARTICLES 2	Textbook
7	MIDTERM EXAM I	Textbook
8	CHARACTERIZATION OF NANOMATERIALS 1 TEM, SEM, XRD	Textbook
9	CHARACTERIZATION OF NANOMATERIALS 2 DLS, TGA, UV-VIS	Textbook
10	CHARACTERIZATION OF NANOMATERIALS 3 FTIR, VSM, BET	Textbook
11	APPLICATIONS OF NANOMATERIALS IN GENERAL	Textbook
12	BIOMEDICAL APPLICATIONS OF NANOMATERIALS	Textbook
13	PROJECT PRESENTATIONS BY STUDENTS	Textbook
14	PROJECT PRESENTATIONS BY STUDENTS	Textbook

RECOMMENDED SOURCES	
Textbook	Bucak, S. And Rende, D., Colloid and Surface Chemistry: A Laboratory Guide for Exploration of the Nano World, 1st ED., CRC Press, 2019
Additional Resources	

MATERIAL SHARING	
Documents	
Assignments	
Exams	

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Midterm	1	30
Proje	1	35
Total		**65**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		35
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		65
Total		**100**

COURSE CATEGORY	Field Courses

COURSE'S CONTRIBUTION TO PROGRAM							
No	Program Learning Outcomes	Contribution					
		1	2	3	4	5	
1	Acquire expanded and in-depth information via performing scientific research in the field of Chemical Engineering, evaluate, interpret and implement knowledge.			+			
2	Be knowledgable in the contemporary techniques and methods applied in Chemical Engineering and their respective constraints.					+	
3	Be cognizant of the novel and developing applications of his/her profession, study and learn them as required.					+	
4	Formulate Chemical Engineering problems, develop methods to solve them and implement innovative techniques in solutions						

5	Design and conduct analytical modeling and experimental research, analyze and interpret complex problems encountered in this process.					
6	Develop novel and/or original ideas and methods; conceive innovative solutions in systems, component and process design					
7	Complete information via processing limited or incomplete data by the use of scientific methods and implement it; integrate knowledge from different disciplines					
8	Communicate in at least one foreign language at the level of European Language Portfolio B2 orally and in writing.					+
9	Communicate stages and results of his/her studies in a systematic and clear manner orally or in writing in intra or interdisciplinary national and international settings.					
10	Defines societal and environmental aspects of Chemical Engineering applications		+			
11	Observe social, scientific and ethical values during collection, interpretation, and dissemination of data and in all professional activities.					
12	Lead multidisciplinary teams, develop solution methodologies for complex problems and take responsibility					

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration	13	3	39
Hours for off-the-classroom study (Pre-study, project)	14	10	140
Mid-terms	1	5	5
Case Study	5	10	50
Final examination	1	5	5
Total Work Load			239
Total Work Load / 25 (h)			9.56
ECTS Credit of the Course			10