

Course Name						
PROBLEM SOLVING TECHNIQUES, DESIGN & PROJECT MANAGEMENT AND INNOVATION						
Code	Semester	Local Credits	ECTS Credits	Course Implementation, Hours/Week		
				Theoretical	Tutorial	Laboratory
MET 435E	7	1.5	3	1	1	-
Department/Program		Metallurgical and Materials Engineering				
Course Type		Required		Course Language	English	
Course Prerequisites		MET 353E				
Course Category by Content, %	Basic Sciences		Engineering Science	Engineering Design	General Education	
	-		20	60	20	
Course Description	The course will include the definition of engineering problems, classification of problems open ended and closed ended problems, engineering designs; conceptual design, embodiment design, detailed design, innovation culture, concurrent engineering, team work, human as a social entity in team works, project management, project proposal writing, an innovative problem solving technique: TRIZ (Theory of Inventive Problem Solving)					
Course Objectives	Problem Solving Techniques and Design course is an important engineering course for engineers in order to differentiate, understand and solve engineering problems. This course will emphasize on; 1. Understanding of engineering problems, 2. Finding engineering solutions to the problems and design product/process in light of the solutions, 3. Importance of innovative thinking and patents, innovation culture management. 4. Selection materials and processes, 5. Team work 6. Project proposal writing and managing projects according to the proposals 7. Project Management 8. Development of innovative thinking 9. Improvement of students' written and oral communication					
Course Learning Outcomes	Students who pass the course will be able to: 1. Differentiate open and closed ended problems 2. To make a design with solutions via using problem solving techniques (TRIZ, Quality Tools and Techniques and, etc) 3. How to express their inventive ideas in project proposal and preparing a project proposal 4. How to manage a project with a team 5. How to read patents and papers and importance of innovative approach 6. To make a project report 7. To improve their communicating skills (written and oral) via presenting a project proposal and project results					
Textbook	Handouts on Problem Solving Techniques and Design					
Other References						
Homework & Projects	In the course To improve their literature research ability and reading, understanding and writing ability, a subject will be given and a written report (paper) will be asked from papers and patents found during their literature survey. A paper is investigated and problem, design and innovative solution in the paper will be reported. One closed ended problem will be given and written report as a team will be asked explaining the scientific idea behind the solution. Several open ended problems will be given. Students as teams will choose one of the problems and close them and propose solutions with using problem solving techniques and make a project proposal and present their proposal orally. Then the teams will work on their solutions and make a project report showing their designs including their solutions. And a project plan is also asked to submit by using project management software. In term papers the same approach will be used. The same teams will be working on problems given at the end of the semester and a project proposal and a project report will be asked from each team. And a project plan is also asked to submit by using project management software.					
Laboratory Work						
Computer Use	MICROSOFT PROJECT					
Other Activities	Before making teams, each student prepares her/his CV and each student also fill out a survey called Thomas Killman Conflict Management to see their behaviors in cases of conflict. Students are free to choose their team members. During team meetings they have prepares minutes of meetings and submit them along with their assignment. They also fill out a survey to evaluate teammates at the end of the semester. Ten percent of this survey outcome is added to the mid term grades.					
Assessment Criteria)	Activities			Quantity	Effects on Grading, %	
	Midterm Exams			1	20	
	Quizzes					
	Homework			2 MIN	15	
	Projects			1	30	
	Term Paper/Project			1	35	
	Laboratory Work					
	Other Activities			1		
Final Exam						

COURSE PLAN

Weeks	Topics	Course Outcomes
1	Definition of engineering problems.	1
2	Classification of problems open and closed ended problems.	1
3	Engineering designs; conceptual design, embodiment design, detailed design	2
4	Design techniques	2
5	Concurrent engineering	1,2
6	Team work, human as a social entity in team works	4
7	Materials and Process Selection, the definition of quality characteristics	2
8	Ideas through innovative projects,	2,5
9	An innovative problem solving technique:TRIZ (Theory of Inventive Problem Solving) Writing and presenting design projects	2,5
10	Project management: Constructing a project proposal	3,4,5
11	Managing a project	6
12	Project proposal writing	3,6
13	Presentations	6,7
14	Presentations	6,7

Relationship between the Course and Metallurgical and Materials Engineering Curriculum

	Student Outcomes	Level of Contribution		
		1	2	3
1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering science and mathematics			X
2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare as well as global, cultural, social, environmental and economic factors			X
3	an ability to communicate effectively with a range of audiences			X
4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts			X
5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives			X
6	an ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgement to draw conclusions	X		
7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies			X

1: Little, 2. Partial, 3. Full

Course relationships with major elements of the field and material classes

		Level of Contribution		
		1	2	3
MAJOR ELEMENT OF THE FIELDS	STRUCTURE	X		
	PROPERTIES	X		
	DESIGN EXPERIMENT/ANALYSE DATA	X		
	PROCESSING		X	
	COST/PERFORMANCE			X
	QUALITY/ENVIRONMENT			X
	DESIGN PROCESS OR PRODUCT			X
MATERIAL CLASSES	METAL			X
	CERAMICS AND GLASS			X
	POLYMERS			X
	COMPOSITES			X
	BIOMATERIALS			X

1: Little, 2. Partial, 3. Full

Prepared by Prof. Dr. Özgül Keleş	Date December 2020	Revision #	Signature
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