Course Name						
PROBLEM SOLVING TECHNIQUES, DESIGN AND PROJECT MANAGEMENT						
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, 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 4. Selection materials and proceeses, 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: I) Differentiate open and closed ended problems II) To make a design with solutions via using problem solving techniques (TRIZ, Quality Tools and Techniques and, etc) III) How to express their inventive ideas in project proposal and preparing a project proposal IV) How to manage a project with a team V) How to read patents and papers and importance of innovative approach VI) To make a project report VII) 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 search on a project funding organizations and institutions in Turkey and EU and their priorities, project proposal dates, documentation needed and etc. will be asked. Students as teams will make a list from their research. 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. Each person in the teams are evaluated by their team members this evaluation results also affects their grades.
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	**-**	**-**
	Quizzes	**-**	**-**
	Homework	**2 MAX.**	**15**
	Projects	**1**	**40**
	Term Paper/Project	**1**	**45**
	Laboratory Work	**-**	
	Other Activities	**1**	**-**
	Final Exam	**-**	**-**

COURSE PLAN

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

Relationship between the Course and Metallurgical and Materials Engineering Curriculum

	Program Outcomes	Level of Contribution		
		1	**2**	**3**
1	Ability to apply the knowledge of mathematics, science and engineering principles to solve problems in metallurgical and materials engineering (ABET:a)		**X**	
2	Ability to characterize materials using standard and/or self designed experimental methods and to evaluate the results (ABET:b)	**X**		
3	Ability to design a system or a process, taking into consideration of the desired specifications, quality, ethics and environment. (ABET:c)		**X**	
4	Ability to communicate both orally and in the written form and to take part in, and provide leadership of the teams in the elucidation of engineering problems; (ABET:d, g)			**X**
5	Ability to define, formulate and solve engineering problems in the development, production, processing, protection and usage of engineering materials. (ABET:e)			**X**
6	An understanding of professional and ethical responsibilities(ABET:f)	**X**		
7	An understanding of current/contemporary issues and impact of engineering solutions in broad cultural, national and global levels;. (ABET:h, j)			**X**
8	A comprehension of the nature of engineering progress closely linked with the development of new materials and production processes. An ability to engage in life-long learning and a recognition of its necessity (ABET:i)			**X**
9	Ability to use essential tools and techniques of modern engineering in the development, production, processing, protecting of the existing and new engineering materials. (ABET:k)			**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		**X**	
	POLYMERS		**X**	
	COMPOSITES		**X**	

1: Little, 2. Partial, 3. Full

Prepared by	**Date**	**Signature**
Prof. Dr. Özgül Keleş	December 2020	