MBN 305 Phase Diagrams and Transformations		Department of Materials Science & Nanotechnology Engineering	
Semester	**Credit**		
	Theory	**Practice**	**Laboratory**
2014/2015 Spring	3	0	0
Compulsory / Elective	Compulsory		
Prerequisites	-		
Instructors	Assist. Prof. Dr. Ersin Emre Ören		
Course Description	MBN 305 will provide the basic principles of phase equilibria and phase transformations in general and help students to adapt into this technologically important area. The course will focus mainly on the underlying thermodynamic principles of phase equilibrium, transformation and state. The binary and ternary phase diagrams, kinetics of phase diagrams, diffusion mechanism, and both the diffusional and diffusionless transformations in solids will be discussed.		
Course Objectives	Students who complete this course will be able to: - have a general knowledge about the phase diagrams and transformations; - understand thermodynamics, and apply math, science and engineering to solve the problems related to materials engineering; - have knowledge about the contemporary issues and application areas of materials; - apply engineering and mathematical methods for analysis and design of materials; - use techniques, skills and tools necessary for engineering practice.		
Course Outcomes	Key areas of achievements will be obtaining necessary information about the basic principles phase equilibria and phase transformations, and applying this know-how for the solution of engineering problems: in specific structure-property relationships for materials.		
Textbook	• M. Hillert. *Phase Equilibria, Phase Diagrams and Phase Transformations*, 2nd Ed., Cambridge University Press, Cambridge, 2008. • D. A. Porter, K. E. Easterling, M. Y. Sherif. *Phase Transformations in Metals and Alloys*, 3rd Ed., *CRC Press*, 2009.		
Other Resources	• P. Atkins. *The Laws of Thermodynamics: A Very Short Introduction*, Oxford University Press, Oxford, 2010. • W. D. Callister, *Materials Science and Engineering: An Introduction*, 7th / 8th Ed., John Wiley and Sons, New York, 2011. • P. Shewmon. *Diffusion in Solids* 2nd Ed., TMS, 2010. • Articles		

Evaluation Criteria		**Number**	**Impact (%)**
	Midterm Exams	1	25
	Quiz + Homework	5+	25
	Projects	1	20
	Term Paper	-	-
	Laboratory	-	-
	Others	-	-
	Final	1	30

Distribution of Course Content into Basic Fields (%)		
	Mathematics and Basic Sciences	20
	Engineering Sciences	50
	Engineering Design	30
	Social Sciences	-

COURSE OUTLINE

Week	Subject
1	Introduction
2	Basic Laws of Thermodynamics
3	Materials Thermodynamics
4	Diffusion in Solids
5	Diffusion in Solids
6	Phase Equilibria in Binary Systems
7	Phase Transformations
8	Phase Transformations
9	Phase Equilibria in Ternary Systems
10	Thermodynamics of Irreversible Processes
11	Diffusionless Transformations
12	Diffusionless Transformations

RELATIONSHIP BETWEEN THE COURSE AND THE DEPARTMENT PROGRAM

	Program Outcomes	1	2	3
1	Ability to apply mathematical, scientific and engineering knowledge			√
2	Ability to design and conduct experiments, analyze and interpret the experimental results		√	
3	Ability to design systems, components or process as desired/required			√
4	Ability to work in interdisciplinary teams			√
5	Ability to identify, formulate and solve engineering problems			√
6	Ability to communicate effectively in English and Turkish		√	
7	Comprehensive training necessary to understand the impact of the engineering solutions on globe and society			√
8	Knowledge of contemporary issues			√
9	Ability to use modern tools, techniques and skills necessary for engineering practice			√

Course Contribution: 1: None 2: Partial 3: Full