

MM 412E Plant Layout And Design				DEPARTMENT of MECHANICAL ENGINEERING					
Semester	Methods of Education							Credits	
	Lecture	Recit.	Lab.	Project / Field Study	Homework	Other	Total	Credit	ECTS Credit
8	42	0	-	33			75	3	3.0
Language	English								
Compulsory / Elective	Elective								
Prerequisites	None								
Course Contents	System, manufacturing system and factory concepts. For a given product design and market research selection of manufacturing processes, machineries, material handling systems and other equipments will be performed. Then, plant layout will be formed and a financial feasibility study for the factory will be performed. In order to perform the described factory design stages 1) manufacturing processes will be compared and explained; 2) machineries (machining centers, preses, etc.) used for selected processes will be explained and their capabilities will be compared; 3) material handling and storage systems such as AGVS, conveyors, robots, inventory systems, AS/RS, interm stocks used in factories will be described and compared; 4) layout types (product layout, process layout, cellular layout, fixed-position layout) and algorithms for determination of the best layout will be explained; and finally 5) concepts necessary for feasibility analysis using actual values for revenues and expenses during the life of a factory will be explained in the course.								
Course Objectives	Students will learn how to design a factory starting with drawings and market research of a product family with practical examples.								
Learning Outcomes and Competences	Students are expected to understand all related concepts with factory design and apply the concepts in a structural way. They are also expected to evaluate and make improvements in factories' layouts, processes, machineries and flow of work parts in practice.								
Textbook and /or Reference	1) Scallon, P., Process Planning - The Design/ Manufacture Interface, Butterworth- Heinemann, Burlington, 2003. 2) Facilities Planning, J. A. Tompkins, J. A. White, Y. A. Bozer, Facilities Planning, (Second Edition), John Wiley & Sons, Inc., Second Edition, 1996. 3) Manufacturing Facilities Design and Material Handling, F. E. Meyers, M. P. Stephens, Prentice Hall, Inc. Second Edition, 2000.								
Assessment Criteria						If any, mark as (x)		Percentage (%)	
	Midterm Exams					X		30	
	Quizzes								
	Homeworks								
	Projects					X		30	
	Term Paper								
	Laboratory Work								
	Other								
Final Exam					X		40		
Instructors	Assoc.Prof. Mustafa YURDAKUL								
Week	Subject								
1	INTRODUCTION: Factory design, its operating environment, stages in factory design, definition of selection problem in factories, selection examples, importance of product characteristics.								
2-3	PROCESS SELECTION: Explanation and comparison of manufacturing processes, PRIMA matrix, process selection flow charts, importance of cost in process selection.								
4-5	MACHINERY SELECTION: Selection of machineries using multi-criteria selection models. Types and models of various machineries will be described.								
6	MATERIAL HANDLING: Goals of material handling, The 20 principles of material handling, The material handling problem-solving procedure, material handling checklist, material handling cost calculations.								
7	MATERIAL HANDLING SYSTEM SELECTION: AS/RS systems, Conveyors, Automated Guided Vehicle Systems, Trucks, Cranes, Calculations for necessary number of material handling equipment in a plant. Comparison of various material handling equipments.								
8-9	FORMATION OF PLANT LAYOUT: Layout types such as Function layout, Line layout, Project layout, Cellular Layout. Advantages and disadvantages of each layout type, relating plant layout types with product and demand characteristics.								
10	INITIAL LAYOUT FORMATION AND ITS IMPROVEMENT IN FUNCTIONAL LAYOUT: From-To chart, Activity relationships diagram, Dimensionless block diagram, Flow analysis, Determination of relative location of departments in functional layout.								
11	FLEXIBLE MANUFACTURING SYSTEMS (FMS) AND CELLULAR LAYOUTS: Components of FMS: Machining centers, robots, material handling equipments, Layout types used in FMS, Examples of FMS. The need for cellular manufacturing, part family formation, manufacturing cell concept and formation, cell layout, inventory concept and usage of kanbans in cellular manufacturing, machine layout in a single cell, integration of cells.								
12	OTHER CRITICAL ISSUES IN PLANT DESIGN: Selection of cutting tools, jigs and fixtures, calculation of number of machines factory capacity, technology level in plants, plant location.								
13-14	FINANCIAL FEASIBILITY ANALYSIS: Determination of all actual expenses and revenues during the operation of the factory. Understanding all related concepts such as depreciation, inflation, working capital, initial cost, annual costs, risk analysis and making all necessary financial calculation in Excel. Writing a detailed feasibility report.								