PRODUCTION SYSTEMS

1	Course Title:	PRODUCTION SYSTEMS	
2	Course Code:	END5110	
3	Type of Course:	Optional	
4	Level of Course:	Second Cycle	
5	Year of Study:	1	
6	Semester:	2	
7	ECTS Credits Allocated:	7.50	
8	Theoretical (hour/week):	3.00	
9	Practice (hour/week):	0.00	
10	Laboratory (hour/week):	0	
11	Prerequisites:	None	
12	Language:	Turkish	
13	Mode of Delivery:	Face to face	
14	Course Coordinator:	Prof. Dr. ERDAL EMEL	
15	Course Lecturers:		
16	Contact information of the Course Coordinator:	erdal@uludag.edu.tr Tel: 0224 294 2080 Endüstri Mühendisliği Bölümü, Mühendislik Mimarlık Fakültesi Uludağ Üniversitesi, Görükle, Bursa	
17	Website:	http://endustri.uludag.edu.tr	
18	Objective of the Course:	This course aims to teach an engineering approach to the design of production systems in terms of flow modeling and its mathematical representation. Lean manufacturing systems in terms of flow modeling and mathematical notation in terms of integer programming models are the main materials of the course. Throughout the course lectures with the purpose of developing students' skills practical assignments and project work of system modeling and optimization will be covered.	
19	Contribution of the Course to Professional Development:		
20	Learning Outcomes:		
		1	Gain the ability to define strategies and basic concepts of production systems
		2	The ability to define the role of production systems within the company's business strategies
		3	Ability to explain the effects operating efficiency of production systems and strategies
		4	To be adequately equipped in designing the most suitable production systems and processes, compatible with business management objectives
		5	The ability of conducting business and time studies based on process analysis
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21	Course Content:		

	Course Content:	
Week	Theoretical	Practice
1	Production Systems, Lean Thinking (Value, Value Stream, Flow, Pull, Perfection)	
2	Just in Time Production System: Production Planning, Scheduling and Inventory Management (Kanban System), sub-industry relationships (Supply Chain Management)	
3	Just in Time Production System: Production Pre-Times, Times of bench preparation, standardization of operations, bench Layout, Flexible Workforce, Assembly Lines	
4	Midterm 1 Manufacturing Systems Mathematical Modeling and Solution Approaches	
5	Mixed Integer Programming Models: Defining the constraints -1	
6	Mixed Integer Programming Models: Defining the constraints -2	
7	Mixed Integer Programming Solution Algorithms – 1 Modeling with MPL	
8	Mixed Integer Programming Solution Algorithms - 2	
9	Midterm 2 Homework Presentation	
10	Manufacturing System Design - Mathematical Approach: Single / multi-stage and single / multi-product, and the push-type pull control systems	
11	Manufacturing System Design - Mathematical Approach: Logistics and Supply Chain Management	
12	Manufacturing System Design - Mathematical Approach: Planning of Production Lines and Cells	
13	Manufacturing System Design - Mathematical Approach: other Problems	
14	Presentation of Homework	
22	Textbooks, References and/or Other Materials:	Lean Thinking, J.P.Womack, D. T. Jones, Sistem Yayıncılık, 1998. Design and Analysis of Lean Production Systems, Ronald G. Aksin, Jeffrey B. Goldberg, John Wiley and Sons, 2002. Kanban-Controlled Manufacturing Systems, Georg N. Krieg, Springer-Verlag, 2005. Production Planning by Mixed Integer Programming, Yves Pochet, Laurence A. Wosley, Springer-Verlag, 2006. Model Building in Mathematical Programming, H. Paul Williams, John Wiley and Sons, 2005. Applied Integer Programming: Modeling and Solution, Der-San Chen, R. G. Batson, Y. Dang, John Wiley and Sons, 2010.
23	Assesment	

TERM LEARNING ACTIVITIES	**NUMBER**	**WEIGHT**
Midterm Exam	2	25.00
Quiz	0	0.00
Home work-project	2	40.00
Final Exam	1	35.00

Total	5	100.00
Contribution of Term (Year) Learning Activities to Success Grade		65.00
Contribution of Final Exam to Success Grade		35.00
Total		100.00
Measurement and Evaluation Techniques Used in the Course		

24 ECTS / WORK LOAD TABLE

Activites	Number	Duration (hour)	Total Work Load (hour)
Theoretical	14	3.00	42.00
Practicals/Labs	0	0.00	0.00
Self study and preperation	14	7.00	98.00
Homeworks	2	3.00	6.00
Projects	2	38.00	76.00
Field Studies	0	0.00	0.00
Midterm exams	2	2.00	4.00
Others	0	0.00	0.00
Final Exams	1	2.00	2.00
Total Work Load			228.00
Total work load/ 30 hr			7.60
ECTS Credit of the Course			7.50

25 CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS

	PQ1	PQ2	PQ3	PQ4	PQ5	PQ6	PQ7	PQ8	PQ9	PQ10	PQ11	PQ12	PQ13	PQ14	PQ15	PQ16
ÖK1	0	4	3	0	5	0	0	3	4	0	3	4	5	0	0	0
ÖK2	5	3	0	3	0	0	0	4	0	0	0	4	0	3	0	0
ÖK3	5	3	4	3	0	0	0	0	4	0	0	5	0	0	0	0
ÖK4	5	4	4	3	0	0	0	3	0	0	0	0	3	0	0	0
ÖK5	3	4	0	0	0	0	0	4	5	0	0	0	4	0	0	0

LO: Learning Objectives PQ: Program Qualifications

Contribution Level:	1 very low	2 low	3 Medium	4 High	5 Very High