EUROPEAN CREDIT TRANSFER SYSTEM

INFORMATION PACKAGE

DEPARTMENT OF INDUSTRIAL ENGINEERING

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ECTS COORDINATION

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GENERAL INFORMATION

Industrial Engineering is concerned with the process of design, operation, management and improvement of the integrated systems of limited resources such as human, time, money, material, equipments and energy. The main aim of Industrial Engineering is to increase the productivity and efficiency of the systems by using many kinds of scientific methods in each stage of improvements of these systems.

The training program of our department includes human-machine system design, production and service systems improvement and analysis of the engineering activities for a scientific management. The goal of industrial engineering department is to graduate engineers, who have creative minds and adaptation capability for developments through providing them basic knowledge on industrial engineering, training them on effective research, planning, design and application techniques.

Industrial Engineering Department started offering undergraduate programs in 1977-1978 at Ankara Architecture and Engineering Academia as business administration engineering. By the year 1982 the undergraduate program carried on as Industrial Engineering at Gazi University Currently undergraduate programs which has first and secondary (since 1992) education programs and graduate (MSc and PhD) programs are carried on in the department.

Research Interests and Facilities

The education program at Industrial Engineering Department is supported by ergonomics laboratory, flexible manufacturing systems laboratory and two computer laboratories in order to provide necessary experimentations and hands-on exercises.

The first Computer Laboratory has 30 computers networked and also connected to the mainframe backbone. It is utilised at simulation, computer programming etc. courses and can be used by students in their own studies. The second computer laboratory has a LAN, which is constituted by one main computer and 15 PCs. The students are encouraged to use computers throughout their homework, projects and researches. Laboratories have a printer, a scanner and slide machines

Flexible Manufacturing Laboratory is set up to let the students have knowledge and experience on computer integrated manufacturing (CIM) systems. The

laboratory is equipped with a conveyor system, robotic arms, a CNC machine and some components such as tools, pallets etc. required by the production line. Morover there is a control mechanism to make the robotic arm move on the X-Y axis. The students are encouraged to program prototype production applications related to the flexible manufacturing by using the personal computer which control all the equipment with PLC

The ergonomics laboratory consists of the ergonomics measurement tools. These are ergonomics bicycle, sound level meter, vibration meter, precision air humidity meter, audiometer and chronometers.

Requried Conditions

Master's program	**Doctorate program**
1. ALES ≥ 65	1. ALES ≥ 70
2. Yabancı Dil ≥50	2. Yabancı Dil ≥60
3. Cumulative GPA of Bachelor ≥ 2,5	3. Cumulative GPA of Bachelor and Master ≥ 2,5 Cumulative GPA of Master ≥ 3,0

Degree

Industrial Engineering MSc. Degree (with Thesis) 2 years (4 semester)

Industrial Engineering MSc. Degree (without Thesis) 3 years (6 semester)

Industrial Engineering PhD. Degree 4 years (8 semester)

Courses for Fall 2006 semester			
Code	Name	Local Credit	ECTS Credit
IE 508	Discrete Optimization	3	7,5
IE 556	Specıal Topıcs In Modern Manufacturıng	3	7,5
IE 520	Inventory Theory	3	7,5
IE 517	Tıme Serıes Analysıs And Forecastıng Methods	3	7,5
IE 522	Research Techniques In Human Engineering	3	7,5
IE 551	Lojıstıcs Management	3	7,5
IE 507	Linear Optimization	3	7,5
IE 547	Fuzzy Set Theory	3	7,5
	TOTAL	24	60

Academic Staff and Areas of Interest

ACADEMIC STAFF	SCIENTIFIC AREA	AREAS OF INTEREST
Prof.Dr. Fevzi KUTAY	Stochastic Proceses	Stochastic Process, Probabilistic Models, Quality Management
Prof.Dr. Serpil EROL	Production Planning and Inventory Control	Classic and Modern Production Systems, Manufacturing Information Systems and Management, Supply Chain and Logistics Management
Prof.Dr. Zülal GÜNGÖR	Decision Analysis	Operation Research, Optimization, Mathematical Modelling, Fuzzy Set Theory, Cellular Manufacturing Systems
Prof.Dr. Orhan TÜRKBEY	Facility Layout	Advanced Facility Layout, Operations Research, Fuzzy Sets Theory, Artificial Intelligent Algorithms
Prof.Dr. Bilal TOKLU	Mathematical Programming	Linear Programming, Production Planning, Inventory Control, Expert Systems
Prof.Dr. Mustafa KURT	Ergonomy	Work Science, Work Safety, Work Study, Work Accident, Human Resources Management, Work Evaluation
Prof.Dr. Hadi GÖKÇEN	Manufacturing and Service Systems	Production System Modelling, Assembly Line Balancing, Management Information Systems, Decision Support Systems, Data Mining, Service Management, Quality Management
Prof.Dr. Cevriye GENCER	Mathematical Programming	Optimization, Linear Programming, Project Management, Production Planning
Prof.Dr. Ertan GÜNER	Manufacturing and Service Systems	Scheduling, Production System Modelling, Robotic, Recovery Management, Outomatic Material Handling Systems
Prof.Dr. Ö. Faruk BAYKOÇ	Manufacturing and Service Systems	Simulation of Production and Service Systems, Performance Analysis of Modern Production Systems, Mathematical Programming Based on Linear Programming and Network Analysis.
Prof.Dr. Fulya ALTIPARMAK	Stochastic Proceses	Simulation Modelling of Production and Service Syatems, Heuristic Optimization, Reliability, Quality Management
Assis.Prof.Dr. Mehmet ATAK	Mathematical Programming	Optimization
Assis.Prof.Dr. Bahar ÖZYÖRÜK	Üretim Planlama ve Stok Kontrolü	Modelling of Production Systems, Production Information Systems, Supply Chain Management
Assis.Prof.Dr. Ediz ATMACA	Production Planning and Inventory Control	Production Planning and Inventory Control, Design of Production Information Systems, Supply Chain Management, Modern Production Systems, Facility Layout
Assis.Prof.Dr. Feyzan ARIKAN	Decision Analysis	Mathematical Modelling, Fuzzy Set Theory, Cellular Manufacturing Systems, Multi Objective Dec. Mak.
Assis.Prof.Dr. Erol ŞAHİN	Ergonomy	Marketing, Work Study, Ergonomy, Business Management

Course Contents

IE - 505 PROJECT MANAGEMENT									INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching and Learning Methods (Hours per Semester)**								**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Homeworks**	**Term Paper**	**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**25**	**18**	**23**	**80**	**188**	**3**	**7,5**

Language	Turkish
Compulsory Elective	Compulsory
Prerequisites	None
Course Contents	Introduction to project management, defining project management, project goals, classification of projects, project planning, organization charts of project management, Gantt chart, principles of drawing networks. CPM and PERT methods, finding the completing time of project, finding the critical path, finding the floats, resource allocation, crashing the project. Using linear programming to find critical path, finding the minimum cost of completing the project by the T deadline.
Course Objectives	Teaching the techniques which can be used for the project management and project resource allocation and their applications
Learning Outcomes and Competences	The ability of evaluating the projects, and calculating the completion time and cost.
Text books and/or References	1. Wysocki R. K., Effective Project Management: Traditional, Adaptive, Extereme, Third Edition, Wiley, Indiana, USA, 2003. 2. Howes R.N., Modern Project Management: Successfully Integrating Project Management Knowledge Areas and Processes, American Management Assciation, New York, 2001. 3. Lock D., Project Management, Fourth Edition, Vermont, USA, 1990. 4. Kerzner H., Project Management: A System Approach to Planning, Scheduling and Controlling, New York, 1989.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	25
	Quizzes	-	-
	Homeworks	X	10
	Projects	X	15
	Term Paper	X	15
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	35

Instructors	Prof.Dr. Cevriye GENCER
Week	Subject
1 **2** **3**	Introduction to project management, basic concepts Categorization of the projects Project planning

4	Organizational structures in project management
5	Gantt diagram
6	CPM and its applications
7	PERT and its applications
8	Midterm
9	Project resource planning
10	LP model in project management
11	Computer applications in project management
12	Computer applications in project management
13	Term project presentations
14	Term project presentations

IE - 507 LINEAR OPTIMIZATION								INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching and Learning Methods (Hours per Semester)**							**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**		**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**21**		**125**	**188**	**3**	**7,5**

Language	Turkish
Compulsory Elective	Compulsory
Prerequisites	None
Course Contents	Basic assumptions of linear optimization, modeling, graphical method and geometric theory of linear optimization, matrix form and revised simplex method, theory of duality and the optimality conditions, post-optimality and parametric analysis, bounded variable technique and decomposition.
Course Objectives	To introduce the theoretical and practical aspects of the application of the linear optimization.
Learning Outcomes and Competences	Understanding of theoretical and practical aspects linear optimization.
Text books and/or References	1. Bazarra, S.M.; JarvisJ.J; Sherali, H.D.: Linear Programming and Network Flows, 2nd. Ed., 1990. 2. Ignizio, J.P.; Cavalier, T.M.: Linear Programming, 1994.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	30
	Quizzes	X	10
	Homeworks	-	-
	Projects	X	10
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	50

Instructors	Assist.Prof.Dr. Mehmet ATAK
Week	Subject
1	Definition and Basic Assumptions of Linear Optimization
2	Linear basics, Convex analysis, and polyhedral sets
3	The simplex method
4	Starting solution and conversion
5	The Two-phase and the-Big M methods
6	Revised simplex method
7	Optimality conditions

8	1.Midterm
9	Duality
10	Dual Properties
11	The dual-simplex method
12	Post-optimality analysis
13	2.Midterm
14	Parametric optimization

IE 508 DISCRETE OPTIMIZATION					INDUSTRIAL ENGINEERING DEPARTMENT				
Semester	**Teaching and Learning Methods (Hours per Semester)**							**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Homeworks**	**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**-**	**47**	**99**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Introduction to discrete optimization, structure of discrete optimization, pure and mixed discrete optimization problems, branch-bound method (graphical b&b and dual simplex b&b), cutting plane method, dual cutting method and dual cutting method's solution, formulation of the 0-1 optimization problems and solutions of the 0-1 optimization problems, deterministic and probabilistic dynamic programming, network solutions, inventory, resource allocation, equipment replacement scheduling problems, travelling salesmen problems.
Course Objectives	To teach solution methot of integer programming, modelling and solution method of travelling salesman problems
Learning Outcomes and Competences	Learning Integer modelling and solution method's.
Text books and/or References	1. Taha, H.A., Integer Programming: Theory, Applications and Computations, Academic Press, 1975. 2. Salkin, H.M., Integer Programming, Addison-Wesley Publishing Company, 1974. 3. Bazaraa, M. S.; Jarvis, J.J. and Sherali, H.D., Linear Prgramming and Network Flows, John Wiley&Sons, Second Edition, 1990. 4. Hillier, F.S. and Lieberman, G.J., Introduction to Operations Research, McGraw Hill, Sixth edition, 1995. 5. Taha, H.A., Operation Research an Introduction, McMillan, Fifth Edition, 1992. 6. Murty, K.G., Linear and Combinatorial Programming, Robert E. Krieger Publishing, 1985

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	40
	Quizzes	-	-
	Homeworks	X	25
	Projects	-	-
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	35

Instructors	Prof.Dr. Cevriye GENCER
Week	Subject
1 **2** **3**	Graphical solutions, primal simplex , big M methods, two phase methods, dual simplex methods, primal-dual methods. Introduction to integer optimization: Definitions, pure and mixed integer programming,

4	Solving methods, Branch and bound methods : Definitions, principle,search methods, search
5	stratejileri,
6	Branch and bound methods
7	Gomory cuttin methods: Definitions, Fractional cut,
8	All integer cut
9	Mixed cut
10	Primal all integer cut
11	Midterm
12	0-1 integer modelling
13	0-1 optimization
14	Traveling salesman problems

IE 509 PRODUCTION SYSTEMS PLANNING									INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching and Learning Methods (Hours per Semester)**								**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Homeworks**	**Term Paper**	**Other**	**Total**	**Lecture**	**Recit.**
1	**42**	**-**	**-**	**-**	**28**	**38**	**80**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Compulsory
Prerequisites	None
Course Contents	The general concepts and design of production planning and control systems, Static and dynamic production planning models, lot-size models, other models of production planning and control, network models for production planning and control, using softwares for productin planning.
Course Objectives	Providing advanced information about Production Planning and Inventory Control, instruction of the all techniques, lot sizing models that can be applied in real production systems and their implementations.
Learning Outcomes and Competences	Ability of building up the production models subject to resource constraints which can be applied to real systems.
Text books and/or References	1. Johnson, L.A., and Montgomery, D.C., Operations Research in Production Planning, Scheduling and Inventory Control, John Willey, 1974. 2. Hax, C.H., Candea, D., Production and Inventory Management, Prentice-Hall, 1984. 3. Heizer, J., Render, B., Operations Management, IE Edition, Prentice-Hall,2004.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	15
	Projects		
	Term Paper	X	20
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	35

Instructors	Prof.Dr.Serpil EROL
Week	Subject
1	Introduction to production systems planning. Basic concepts
2	Master production planning.aggregate planning
3	Lineer programming models for production systems
4	LP models for single / muti item production systems. Goal programming models
5	Quadratic cost models
6	Capacitated and uncapacitated lot size models
7	Multi-product lot size models

8	Midterm
9	Single/multi-product nonlinear models
10	Single/multi-product network models
11	Multi-stage production models
12	Heuristic decision rules, search decision rules
13	Term project presentations
14	Term project presentations

IE 510 SUPPLY CHAIN MANAGEMENT					INDUSTRIAL ENGINEERING DEPARTMENT					
Semester	**Teaching and Learning Methods (Hours per Semester)**								**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Homeworks**	**Term Paper**	**Other**	**Total**	**Lecture**	**Recit.**
1	**42**	**-**	**-**	**-**	**30**	**40**	**76**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Fundamentals of supply chain management and enterprise resources planning (ERP); aggregate production static, dynamic, nonlinear and lot sizing models; operations scheduling; flow shops and job shop management and materials requirement planning (MRP); capacity resources planning (CRP); distribution management; implementation of manufacturing management strategies.
Course Objectives	To introduce Supply Chain Management and understanding management strategies.
Learning Outcomes and Competences	Understanding of Supply Chain Management and to examine real word problems
Text books and/or References	1.Simchi-Levi D., Kaminsky P., Simchi- Levi E., 2003, Designing and Managing The Supply Chain, Mc Graw-Hill Irwin 2.Vollmann T.,Berry W.L., Whyberk D.C.Jacobs,F.R., 2004, Manufacturing Planning and Control Systems for Supply Chain MAnagement,Mc Graw-Hill

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	15
	Projects		
	Term Paper	X	20
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	35

Instructors	Prof.Dr.Serpil EROL, Yrd.Doç.Dr. Bahar ÖZYÖRÜK
Week	Subject
1	Analyze of Supply Chains
2	Planning Demand and Supply in a Supply chain
3	Invenories in A Supply Chain
4	Designing the Supply Chain Network
5	The Role of Distribution inthe Supply Chain
6	Design Options for a Disturbution Network
7	Factors Influencing Network Design Decisions

8	Models for Facilities Location and Capacity Allocation
9	Evaluating Network design Decisions Using Decision Trees
10	Transportation in the Supply Chain
11	Outsourcing in the Supply Chain
12	Information Tecnology and the Supply Chain
13	Supply Chain Operations Reference Model(SCOR)
14	Case Study

IE 511 SYSTEM SIMULATION					INDUSTRIAL ENGINEERING DEPARTMENT					
Semester	**Teaching and Learning Methods (Hours per Semester)**								**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Homeworks**	**Term Paper**	**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**-**	**26**	**40**	**80**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Simulation methodology and its comparison with other techniques. Selecting input distributions, statistical analysis of output. Variance reduction techniques. Simulation Optimization. Selected applications of simulation in production or service systems. Students are required to carry out real-life projects in teams with SIMAN or ARENA.
Course Objectives	To introduce the importance of simulation technique in modeling and analysis of complex systems. To examine the applications of simulation in service and production systems with the purposes of performance analysis in a system, comparing of alternative systems and optimization.
Learning Outcomes and Competences	To get an ability for modeling and analysis of a system with simulation technique and designing new systems and comparing them. Improve the ability of desicion making.
Text books and/or References	1. Law, A.M., Kelton, W.D., 2000, Simulation Modelling and Analysis, McGraw Hill Inc. 2. Banks, J. 1998, Handbook of Simulation, John Wiley & Sons,

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	15
	Projects	-	-
	Term Paper	X	20
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	35

Instructors	Prof.Dr. Fulya ALTIPARMAK
Week	Subject
1	Input Analysis in Simulation
2	Input Analysis in Simulation
3	Input Analysis in Simulation
4	Verification and Validation of Simulation Models
5	Verification and Validation of Simulation Models

6	Output Analsis in Simulation
7	Output Analsis in Simulation
8	Output Analsis in Simulation
9	Variance Reduction Techniques
10	Variance Reduction Techniques
11	Experimental Design and Metamodeling Approach
12	Experimental Design and Metamodeling Approach
13	Simulation Optimization
14	Paper Reviews

IE 514 SYSTEM RELIABILITY				INDUSTRIAL ENGINEERING DEPARTMENT					
Semester	**Teaching and Learning Methods (Hours per Semester)**							**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Homeworks**	**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**36**	**30**	**80**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Reliability concept and introduction to reliability, reliability function generation, exponential and poisson distributions, reliabilities of series or parallel systems, network reliability, measuring and testing of reliability.
Course Objectives	To introduce importance of reliability in engineering applications. To teach methods used in calculation and optimization of system reliability.
Learning Outcomes and Competences	To get an ability for using appropraite methods to calculate and optimize of system reliability.
Text books and/or References	1. Elsayed, E. A., 1996, Reliability Engineering, Prentice Hall. 2. Kuo, W., Prasad, V. J. R., Tillman, F., Hwang, C.L., 2001, Optimal Reliability Design: Fundamentals and Applications, Cambridge University Press. 3. Kapur, K.C., Lamberson, L.R., 1977, Reliability in Engineering Design, John Wiley & Sons.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	25
	Quizzes	-	-
	Homeworks	X	15
	Projects	-	-
	Term Paper	X	20
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	Prof.Dr. Fulya ALTIPARMAK
Week	Subject
1	Reliability concept, basic system configurations and reliability functions
2	Fundamental system reliability models
3	General methods for system reliability evaluation
4	General methods for system reliability evaluation
5	General methodology for reliable system design
6	Analysis and classifications of reliability optimization models

7	Optimization approaches for reliable system design
8	Optimization approaches for reliable system design
9	Heuristic approaches for reliable system design
10	Component assignment in reliability system
11	k-out-of-n system models and design
12	k-out-of-n system models and design
13	Multistate system models
14	Literature review

IE 517 TIME SERIES ANALYSIS AND FORECASTING METHODS								INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching and Learning Methods (Hours per Semester)**							**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Term Paper**	**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**-**	**52**	**94**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Objective of time series analysis, some concepts, autocovariance and autocorrelation, stationary and nonstationary time series, Box-Jenkins models, ARMA and ARIMA models, model identification, parameter estimation, fitness tests, forecasting with Box-Jenkins models.
Course Objectives	To introduce importance of forecasting in engineering applications. To teach the techniques (extrapolation technqiues) for forecasting future values of a time series from past values of a time series.
Learning Outcomes and Competences	To get an ability for using appropriate forecasting techniques as a decision making tool in uncertain environment.
Text books and/or References	1. Box, G.E.P, et al, 1994, Time Series Analysis: Forecasting and Control, Holden Day, S 2. Bowerman, B.L., O'Connell, R.T., 1979, Time Series and Forecasting, Duxbury. 3. Vandale, W., 1983, Applied Time Series and Box-Jenksin Models, Academic Pres Inc.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	25
	Quizzes	-	-
	Homeworks	-	-
	Projects	-	-
	Term Paper	X	25
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	50

Instructors	Prof. Dr. Fevzi KUTAY, Assis.Prof.Dr. İzzettin TEMİZ
Week	Subject
1	Introduction, the defination of the estimation, importance of the estimation and kinds of the estimation technique
2	The defination of the time series and the movement of the time series
3	The analysis of the time series, the purpose of the time series and the analysis of the movement of time series
4	Stochastic processes and Box-Jenkis stochastic processes models

5	Stochastic processes and Box-Jenkis stochastic processes models
6	The concepts of autocorrelation, variance,particular autocorrelation at the time series
7	Determine model to time series and temporal parameter estimation and aplications
8	Determine model to time series and temporal parameter estimation and aplications
9	Efficient parameter estimations
10	I. Midterm examination
11	The estimation at the stationary and nonstationary models
12	Interval estimation at the Box-Jenkis models
13	The applications
14	The applications

IE 518 PRODUCTION MANAGEMENT SYSTEMS									INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching and Learning Methods (Hours per Semester)**								**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Homeworks**	**Term Paper**	**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**-**	**32**	**40**	**74**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	The concept of computer integrated production management, the just in time (JIT) approach, manufacturing systems design and planning for JIT, the Kanban system , optimized production technology (OPT) approach, DRP systems, flexible manufacturing systems (FMS) approach, the planning models of FMS, desing and applications of FMS.
Course Objectives	Instruction of modern production and management systems and providing the ağabeylity of using the related software.
Learning Outcomes and Competences	Learning the effects of the technological developments on production management systems and the usage of related softwares gaining knowledge about future factories and their management.
Text books and/or References	1. Browne J., Harhen J. And Shivnan J., Production Management Systems, Prentice Hall,1996. 2. Martin A.J., DRP: Distribution Resource Planning, John Wiley and Sons, 1995. 3. Wight, O.W., The Executive's Guide to Successful MRP II, Prentice Hall, 1983.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	15
	Projects		
	Term Paper	X	20
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	35

Instructors	Prof.Dr.Serpil EROL
Week	Subject
1 **2** **3** **4**	Developments in production management and CIM approach Development of the automation in manufacturing (CAD/CAE, CAPP, CAM, FMS) Material and resource management (MRP and MRP II) Distribution Requirements Planning, Distribution Resource Planning

5	Structure of the distribution systems
6	Distribution problems and their solution methods
7	Customer relation management
8	Enterprise resource planning
9	Midterm
10	Just in time and lean production philosophies, Optimum Production Technology
11	Supply Chain Management and Logistics
12	e-business, e-commerce and operations management
13	Future of the production management systems
14	Factories of future and thoughts on their management systems

IE 519 ADVANCED ENGINEERING ECONOMICS	INDUSTRIAL ENGINEERING DEPARTMENT

Semester	Teaching and Learning Methods (Hours per Semester)							Credits	
	Lecture	Recit.	Lab.	Project/ Field Study		Other	Total	Local Credit	ECTS Credit
1	42	-	-	36		110	188	3	7.5

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Investment projects and its cash flow, interest and equivalance, measures of investment worth, development of the effects of inflation, deterministic models, linear programming models, discerate models, dynamic models, multiple-criteria optimization models, utility theory, measures of investment under risk, decision tree, methods of comparing risky projects, portfolio theory.
Course Objectives	To introduce measures of investment worth,.knowledge of mathematical, engineering and scientific principles that underlie the basic application areas of industrial engineering.
Learning Outcomes and Competences	Be able to apply knowledge of science and engineering, be able to identify, formulate and solve engineering problems, have a knowledge of contemporary issues.
Text books and/or References	1- Chan S. Park,Gunter P, Sharpe-Bettle, (2001),Advanced Engineering Economics, Wiley and. (Ders kitabı) 2- Chan S. Park, (2001), Contemporary Engineering Economics. Prentice Hall..

Assessment Criteria		If any,mark as (X)	Percentage
	Midterm Exams	X	30
	Homeworks	-	-
	Projects	-	-
	Term Paper	X	20
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	50

Instructors	Prof. Dr. Zülal GÜNGÖR
Week	Subject
1	Introduction to time preference and types of interest Summary of nominal and effective interest
2	Effect of Inflation on cash flow equivalence The net present value criterion
3	Internal rate of return, MARR and other rating criteria
4	Model formation; Deterministic capital budgeting model The use of linear programming
5	Capital budgeting with multiple alternatives
6	Measures of investment worth under risk

7	Decision rule for probabilistic models;
8	Decision tree
9	Midterm
10	Utility theory; Properties and determination of utility functions
11	Risk simulation and using simulation in investment project
12	Student project presentation
13	Student project presentation
14	Student project presentation

IE 520 INVENTORY THEORY								INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching and Learning Methods (Hours per Semester)**							**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**		**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**47**		**99**	**188**	**3**	**7,5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Analysis of production-inventory systems, deterministic single-item models with static demand, multi- items and constraints, stochastic single-period models, periodic review models, continuous review models, lot-size problems with dynamic demand.
Course Objectives	To provide the industrial engineering abilities with a conceptual understanding of inventory theory in solving real-life problems,
Learning Outcomes and Competences	To accomplish the organization's mission by using the manufacture resource of a firm in the most efficient and effective ways possible.
Text books and/or References	1. Narashimhan, S.L, McLeavey, D.W., Billington, P.J., (1995), Production Planning and Inventory Control, 2nd. ed., Prentice Hall, (Textbook) 2. Johnson, L.A., Montgomery, D.C., (1974), Operations Research in production Planning, Scheduling, and Inventory Control, John Wiley and Sons, Inc

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	25
	Quizzes	-	-
	Homeworks	-	-
	Projects	X	25
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	50

Instructors	Prof.Dr. Serpil EROL, Prof.Dr. Bilal TOKLU
Week	Subject
1	BASIC INVENTORY SYSTEMS Definitions, Functions of inventory systems, Generalized inventory model, Types of inventory policies,
2	BASIC INVENTORY SYSTEMS: Deterministic Single-Item Models: Economic order quantity model, Production rate model, EPQ and Just in time, All unit discount model
3	BASIC INVENTORY SYSTEMS: Incremental Discount model, EPQ and shortages model, Periodic inventory systems

4	BASIC INVENTORY SYSTEMS : Dynamic Models. Periodic review lot-size problems, Forward algorithm- backlogging permitted
5	MULTI-ITEM JOINT REPLENISHMENT MODELS Deterministic Multi-Item Models: Economies of joint replenishment, Joint replenishment order quantity model, Joint replenishment order model with varying item cycle
6	MULTI-ITEM JOINT REPLENISHMENT MODELS: Brown's algorithm, Silver's algorithm, Kaspi and Rosenblatt algorithm
7	MIDTERM EXAM I
8	INVENTORY MANAGEMENT UNDER RISK: Joint replenishment production quantity model, Introduction to probabilistic inventory systems, Single period model
9	INVENTORY MANAGEMENT UNDER RISK: Service level and safety stock, Percent order service, Safety stock and multiperiod case
10	INVENTORY MANAGEMENT UNDER RISK: Percent unit service, Safety stock, Backorder or Lost sale case
11	INVENTORY MANAGEMENT UNDER RISK: Joint determination of Q and R, Lead time adjustments, Lead time variability, Time-varying demand, Anticipated price increases
12	INVENTORY MANAGEMENT WITH LEARNING EFFECT
13	INVENTORY MANAGEMENT WITH TIME VALUE OF MONEY
14	INVENTORY MANAGEMENT WITH MAINTENANCE PLANNING

IE 521 PROBABILISTIC ANALYSIS								INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching and Learning Methods (Hours per Semester)**							**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Homeworks**	**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**-**	**30**	**116**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Probability theory and its applications, mathematical structure of probabilistic properties, discrete and continuous random variables, some important random variables and their properties, expected values, moments and moment generating functions of random variables, some limit theorems of probability theory: Law of large numbers, central limit theorem.
Course Objectives	To introduce importance of probability theory in engineering applications. To teach methods used in describing random variation in systems.
Learning Outcomes and Competences	To get an ability for understanding basic properties of the systems which have random variation and for using appropraite mathematical models to analyze these systems.
Text books and/or References	1. Ross, SM, 1985, Introduction to Probability Models, Academic Pres. 2. Ang, AHS, Tang, WH, 1984, Probability Concepts in Engineering Planning and Design, John Wiley& Sons. 3. Papoulis, A., 1984, Probability, Random Variables and Stochastic Process, Mc Graw Hill.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	35
	Quizzes	-	-
	Homeworks	X	15
	Projects	-	-
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	50

Instructors	Prof. Dr. Fevzi KUTAY
Week	Subject
1	Introduction, the historicial development and importance of probability
2	The main concept of probability, The main rule of count, the factorial concept, permutation,
3	combination, Binomial distribution and the theory of pascal
4	The defination of the probability, random experiment, the sample space and event
5	The aksiyom of the probability and the theorem of the probability
6	Conditional probability, bayes theory, stastisticially independent and the theory of product
7	Conditional probability, bayes theory, stastisticially independent and the theory of product
8	Random variable and probability and probability density functions, cumulative probability
9	function

10	I. Midterm examination
11	Expected value and the concept of moment and analysis and moment subtraction functions,
12	markov and chebyshev's inequality and applications
13	Multi dimension random variable common probability (density) functions, marjinal probability
14	density functions and independent of variable

IE 522 RESEARCH TECHNIQUES IN HUMAN ENGINEERING								INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Methods of Education**							**Credits**	
	Lecture	**Recit**	**Lab.**	**Project/ Field Study**		**Other**	**Total**	**Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**94**		**52**	**188**	**3**	**7,5**

Language	Turkish
Compulsory / Elective	Elective
Prerequisites	None
Course Contents	Introduction to human factors engineering, definition, scope, and aims, the importance of human factors engineering with respect to industrial engineering and management, the evaluation of working, variation of the supply of performance, the anatomical and mechanical structure of the human bbody, analysis of working environment with respect to the anthropometry, working conditions, the designing the workplaces accoriding to ergonomics principles, machine system protections, work accidents, shift working.
Course Objectives	Providing the knowledge to students for fitting job to the man, designing of a work environment regarding to performance limit of worker and productivity of work.
Learning Outcomes and Competences	Assessment of a work system or process considering the ergonomic principles and ability to design this system or process.
Textbook and /or References	1. Research Techniques in Human Engineering, John Weimer, Prentice Hall, 1994 2. Kodak's Ergonomic Design for People at Work , Second Edition, Eastman Kodak 3. ISBN: 0-471-41863-3, October 2003 4. Occupational Ergonomics : Principles and Applications, Tayyari, F., Smith, J.L., (1997),, Chapman&Hall 5. Human Factors In Engineering and Design, Sanders, M.S., McCormick, E.J., (1993), McGraw-Hill International Editions

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	10
	Quizzes	-	-
	Homeworks	-	-
	Projects	X	80
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	10

Instructors	Prof. Dr. Mustafa KURT
Week	Subject
1	Objectives of Human Factors Engineering (HFE), Systematic Approach to HFE, Research Techniques in HFE
2	Preliminary Presentations of Students Projects
3	Anthropometry and Basic Biomechanics

4	Work Physiology
5	Intermediary Presentations (I) of Sudents Projects
6	Intermediary Presentations (I) of Sudents Projects
7	Work Environment; Noise, Vibration
8	Work Environment; Illumination, Climate
9	Intermediary Presentations (II) of Sudents Projects
10	Intermediary Presentations (II) of Sudents Projects
11	Occupational Safety
12	Man-Machine Interaction, Product Usability
13	Final Presentations of Student Projects
14	Final Presentations of Student Projects

IE 523 GRAPH THEORY						INDUSTRIAL ENGINEERING DEPARTMENT			
Semester	**Teaching and Learning Methods (Hours per Semester)**							**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**		**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**23**		**123**	**188**	**3**	**7,5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Basic concepts. Directed-undirected graphs, connectivity in graphs, digraphs, sub-graphs, co-cycles, planarity, Eularian and Hamiltonian graphs, node and arc coloring.
Course Objectives	To introduce the theoretical and practical aspects of graph theory.
Learning Outcomes and Competences	Understanding of theoretical and practical aspects graph theory.
Text books and/or References	1. Christofides, N.: Graph theory , an algorithmic Approach, 1975. 2. Gould, R.: Graph theory, 1988.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	30
	Quizzes	X	10
	Homeworks	-	-
	Projects	X	10
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	50

Instructors	Assist.Prof.Dr. Mehmet ATAK
Week	Subject
1	General concepts
2	Path and searchs
3	Trees, minimum spanning trees
4	Directed trees
5	1.Midtrem
6	Networks

7	Connectivity and networks
8	Cycles and circuits
9	Hamiltonian graphs and Traveeling salesman problem
10	Planar graphs
11	2.Midterm
12	Matchings
13	Bi-partiate graphs
14	Special applications

IE 525 NETWORK OPTIMIZATION				INDUSTRIAL ENGINEERING DEPARTMENT					
Semester	**Teaching and Learning Methods (Hours per Semester)**							**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**		**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**20**		**126**	**188**	**3**	**7,5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Basic network concepts. Shortest path algorithms, maximum flow algorithms, minimum cost networks, minimum spanning trees, assignment and matching problems, network-simplex method, multi commodity flows, out-of-Kilter algorithm.
Course Objectives	To introduce the theoretical and practical aspects of network optimization.
Learning Outcomes and Competences	Understanding of theoretical and practical aspects network optimization.
Text books and/or References	1. Bazarra, S.M.; JarvisJ.J; Sherali, H.D.: Linear Programming and Network Flows, 2nd. Ed., 1990. 2. Ahuja, R; Magnanti, T.L.; Orlin, J.B.: Network Flows, 1993.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	30
	Quizzes	X	10
	Homeworks	-	-
	Projects	X	10
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	50

Instructors	Assist.Prof.Dr. Mehmet ATAK
Week	Subject
1	Path, trees and cycles
2	Sortest path algoritms, etiketleme yöntemleri
3	Shortest path algorithms, label correcting methods
4	Maximal flow networks
5	1.Midterm
6	Minimum cost flows
7	Assignment and matchings

8	Minimum spanning trees
9	Lagrangian relaxation and network optimization
10	Multicommodity flows
11	Computational tests
12	2.Midterm
13	Konvex cost flows
14	Special applications

IE 530 ADVANCED FACILITIES PLANNING								INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching and Learning Methods (Hours per Semester)**							**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Term Paper**	**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**-**	**25**	**121**	**188**	**3**	**7,5**

Language	Turkish
Compulsory Elective	Compulsory
Prerequisites	None
Course Contents	Production system and design, capacity and selection of technology, plant layout problem, planar single-facility location problems, planar multi-facility location problems, network location problems, cyclic network location problems, advanced discrete-facility location problems, material handling system, selection of communication systems and equipments.
Course Objectives	To introduce the facilities planning topics. To teach relationships between the production system and facilities planning and plant layout algorithms.
Learning Outcomes and Competences	Understanding of the facilities planning topics. Learning the production systems and facilities planning and plant layout algorithms.
Text books and/or References	1. Francis, R.L., Leon, F. McGinnis, Jr., White, J.A., (1992), Facility layout and location: An analytical approach, Prentice Hall, N.J. (Textbook) 2. Sule, D.R., (1994), Manufacturing facilities: Location planning and design, PWS-KENT Pub., Boston. 3. Heragu, S., (1997), Facilities design, PWS Publishing Com., Boston.

Assessment Criteria	**Exams**	**If any,mark as (X)**	**Percentage**
	Midterm	X	40
	Quizzes	-	-
	Homeworks	-	-
	Projects	-	-
	Term Paper	X	10
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	50

Instructors	Prof. Dr. Orhan TÜRKBEY
Week	Subject
1	Production systems, concept and design.
2	Capacity and selection of technology in production systems.
3	Plant layout and location problem.
4	Planar single-facility location problems.
5	Planar single-facility location problems.
6	Midterm Exam 1, Term research project.
7	Planar multi-facility location problems.
8	Network location problems.
9	Network location problems.
10	Cyclic network location problems.
11	Cyclic network location problems.

12	Midterm Exam 2
13	Advanced discrete-facility location problems.
14	Material handling system and selection of equipments.

IE 533 SEQUENCING AND SCHEDULING				INDUSTRIAL ENGINEERING DEPARTMENT					
Semester	**Teaching and Learning Methods (Hours per Semester)**							**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Term Paper**	**Other**	**Total**	**Local Credit**	**ECTS Credit**
	42	**-**	**-**	**19**	**19**	**108**	**188**	**3**	**7,5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Model characteristics, machine configurations, processing characteristics and constraints, objectives and performance measures, general-purpose scheduling procedures, basic dispatching rules, branch and bound ,local search methods, one machine, parallel machine, flow-shop models, sequence-dependen set up times, earliness and tardiness penalties, job shop sheduling, the shifting bottleneck heuristic for makespan and total weighted tardiness.
Course Objectives	To define the importance of scheduling function in manufacturing and service industries. To teach and apply basic methods and techniques employed for solving of the scheduling problems.
Learning Outcomes and Competences	To get an ability for determining of the engineering problems (about scheduling) occurred in manufacturing and service industries and implementing appropriate techniques to solve the problems.
Text books and/or References	1-Baker, K., (1995)., Elements of sequencing and scheduling, Tuck School of Business Admimistration College, hanover, NH. 2- Pinedo., M., Chao, X., (1999), Operations scheduling with applications in manufacturing and services, Mc Graw-Hill. 3- Morton, T.E., Pentico, D.W., (1993) Heuristic Scheduling Systems, with applications to productions to production systems and project management, John Wiley & Sons Inc,. 4- Pinedo., M.L, (1995), Scheduling: Theory, algorithms and systems, Prentice-Hall.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	10
	Projects	X	10
	Term Paper	-	-
	Laboratory Work		
	Other	-	-
	Final Exam	X	50

Instructors	Prof.Dr. Serpil EROL, Prof.Dr. Ertan GÜNER
Week	Subject

1	INTRODUCTION: scheduling: its role and impact, the scheduling function in an enterprise
2	MODEL CHARACTERISTICS: Overview of models, notation, machine characteristics and constraints, objectives and performance measures
3	GENERAL PURPOSE SCHEDULING PROCEDURES: basic dispatching rules, composite dispatching rules, branch and bound , beam search
4	GENERAL PURPOSE SCHEDULİNG PROCEDURES: Local search: simulated annealing and tabu search, genetic algorithms
5	SİNGLE MACHİNE PROBLEMS: foundations, fundamental propositions, problems without due dates, problems with due dates. Enumerations approaches such as dynamic programming, branch and bound .
6	EARLINESS AND TARDINESS PENALTIES: minimizing deviations from a common due date, the restricted version, different earliness and tardiness penalties, quadratic penalties, job dependent penalties, distinct due dates.
7	EXTENSIONS OF THE BASIC MODEL: Dispatching and construction procedures, seqence-dependent setup times.
8	MIDTERM EXAM I.
9	PARALLEL MACHINES: General procedures and herustics for flow time, makespan and other performance measures.
10	FLOW SHOPS SCHEDULING: makespan on a two machine , makespan with more than two machines, heuristics, branch and bound approaches, other objectives and extensions.
11	JOB SHOPS SCHEDULING: Basic methods, exact methods, search heuristics, dispatching methods, : Disjunctive programming and branch and bound, the shifting bottleneck heuristic for the makespan and total tardiness.
12	INTERVAL SCHEDULING , RESERVATION SYSTEMS,: Reservation systems without slack, Reservation systems with slack,
13	TİMETABLING: timetabling with tooling constraints, timetabling with resource.
14	MIDTERM EXAM II.

IE 534 STOCHASTIC PROCESS								INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching and Learning Methods (Hours per Semester)**							**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Homeworks**	**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**-**	**31**	**115**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Probability spaces and classification of stochastic processes, markov chains with discrete and continuous parameter spaces; characterization and limiting behaviour, birth and death processes and their application to queuing theory, introduction to renewal theory.
Course Objectives	To introduce importance of stochastic process in engineering applications. To teach methods for the analysis of stochastic processes
Learning Outcomes and Competences	To get an ability for understanding basic properties of the stochastic process and for using appropraite mathematical models to analyze these systems.
Text books and/or References	1. Ross, S. M. (1996). *Stochastic Processes.* New York: J. Wiley. 2. Durett, R. (1999). *Essentials of Stochastic Processes.* New York: Springer. 3. Bhattacharya, R. N. and Waymire, E. C. (1990). *Stochastic Processes with Applications.* New York: J. Wiley. 4. Resnick, S. I. (1992). *Adventures in Stochastic Processes.* Boston: Birkhaeuser. 5. Cinlar, E. (1975). *Introduction to Stochastic Processes.* Englewood Cliffs, NJ: Prentice-Hall.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	35
	Quizzes	-	-
	Homeworks	X	15
	Projects	-	-
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	50

Instructors	Prof.Dr. Fulya ALTIPARMAK
Week	Subject
1	Probability Spaces and Random Variables
2	Bernoulli Processes
3	Poisson Processes
4	Markov Chaşns
5	Limiting Behaviour and Applications of Markov Zincirlerinin
6	Limiting Behaviour and Applications of Markov Zincirlerinin

7	Continuous-Time Markov Chains
8	Continuous-Time Markov Chains
9	Continuous-Time Markov Chains
10	Renewal Teory
11	Markov Renewal Teory
12	Markov Renewal Teory
13	Stochastic Order Relations
14	Stochastic Order Relations

IE 540 NONLINEAR OPTIMIZATION								INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching and Learning Methods (Hours per Semester)**							**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**		**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**38**		**108**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Local and global optimization, classical optimization theory, the lagrangian function, Kuhn Tucker necessary conditions, quadratic programming, search methods for unconstrained optimization, gradient methods for unconstrained optimization, constrained optimization.
Course Objectives	To introduce nonlinear optimization. fundemantals of optimization,.knowledge of mathematical, engineering and scientific principles that underlie the basic application areas of industrial engineering.
Learning Outcomes and Competences	Be able to apply knowledge of science and engineering, be able to identify, formulate and solve engineering problems.
Text books and/or References	1.G. P. Mc Cormick (1996), Nonlinear Programming, john Wiley and Sons. (Ders kitabı) 2.C. S. Beighhtler, D. T. Phillips, D. J. Wilde, Foundation of Optimization, Prentice Hall. 3.C. L. Luenberger, linear and Nonlinear Programming, Addison Wesley Publishing Company.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	20
	Projects	-	-
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	50

Instructors	Prof. Dr. Zülal GÜNGÖR
Week	Subject
1	The nature of optimization problems, firs order and second order conditions
2	Analytical background, convexity, Matrix method(Hessian matrices)
3	Unconstrained optimization Models
4	Minimization of function with single variable and multiple variable
5	Newton methods, direct search, golden search method, fibonacci search….
6	Conjugate direction algorithms
7	Constrained optimization methods
8	Lagrange functions, K-T conditions
9	Penalty functions
10	Quadratic programming, geometric programming

11	Midterm
12	Student project presentation
13	Student project presentation
14	Student project presentation

IE 542 GROUP STUDY IN OPERATIONS RESEARCH								INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching and Learning Methods (Hours per Semester)**							**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Term Paper**	**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**62**	**35**	**49**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	The aim of this course is modeling and analysis of real world problems using operations research tehniques by groups of the students.
Course Objectives	Application of the operations research techniques to the real world problems and discussion of the benefits, they provide to the systems by doing group and team works.
Learning Outcomes and Competences	The ability of implementing the operations research techniques in order to provide an efficient system operation, the ability of working as a team and group.
Text books and/or References	All the books and articles on the subject of operations research

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	15
	Quizzes	-	-
	Homeworks	-	-
	Projects	X	35
	Term Paper	X	20
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	30

Instructors	All the department instructions
Week	Subject
1	Introduction to Operation Research
2	Introduction to Operation Research
3	Appliying of operation research for real life problems
4	Appliying of operation research for real life problems
5	Literature review/Internet search
6	Researching of solution methods
7	Modelling and testing of the model
8	Modelling and testing of the model
9	Test (Verification and measuring of performance)
10	Project presentation
11	Project presentation

12	Project presentation
13	Project presentation
14	Project presentation

IE 543 HEURISTIC OPTIMIZATION									INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching and Learning Methods (Hours per Semester)**								**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Homeworks**	**Term Paper**	**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**-**	**40**	**51**	**55**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	What is heuristic optimization? for which problems is it used? Introduction to Simulated Annealing, application areas, development and problem oriented algorithms. Introduction to Tabu Search, application areas, development and problem oriented algorithms. Introduction to Genetic Algorithms, application areas, development and problem oriented algorithms. Introduction to Neural Networks, estimation and optimization with Neural Networks. Hybrid algorithms. Verification of results obtained by heuristic optimization.
Course Objectives	To introduce importance of heuristic optimization in engineering applications. To teach methods for solving combinatorial optimization problems
Learning Outcomes and Competences	To get an ability for understanding basic properties of the heuristic optimization and for using appropraite mathematical models to solve combinatorial optimization problems
Text books and/or References	1. Aarts, E., Lenstra, J.K., 2003, Local Search in Combinatorial Optimization, Princeton University Press 2. Michalewicz, Z, Fogel, D.B., 2000, How to Solve It: Modern Heuristics Springer 3. Michalewicz, Z, 1998, Genetic Algorithms + Data Structures = Evolution Programs Springer; 4. Glover, F. W. , Laguna, M., 1998, Tabu Search Springer; 1 edition (June 30, 1998)

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	20
	Quizzes	-	-
	Homeworks	X	20
	Projects	-	-
	Term Paper	X	30
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	30

Instructors	Prof.Dr. Fulya ALTIPARMAK
Week	Subject
1	Optimization, Heuristic methods and NP-hard problem
2	Random Search, Hill-Climbing and Simulated Annealing
3	Simulated Annealing
4	Simulated Annealing
5	Tabu Search
6	Tabu Search

7	Genetic Algorithms
8	Genetic Algorithms
9	Genetic Algorithms
10	Ant Colonies
11	Ant Colonies
12	Hybrid methods
13	Analysis of heuristic methods
14	Literature review

IE 544 DECISION ANALYSIS					INDUSTRIAL ENGINEERING DEPARTMENT				
Semester	**Teaching and Learning Methods (Hours per Semester)**							**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Term Paper**	**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**-**	**48**	**98**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Introduction to decision theory, structuring decisions, making choices, value of information, utility theory and it's applications, sensitivity analysis, complex decisions and simulation, conflicting objectives and solution approaches.
Course Objectives	Teaching both modeling and solution methods used in decision problem, introducing the tools that makes the decision better, teaching the decision making techniques under conflicting objectives.
Learning Outcomes and Competences	Providing the manager with systematical thinking about hard decision, Serving analytical tools that makes complex decision easier to decision makers' use, Learning the related techniques to make a better decision..
Text books and/or References	1. Making Hard Decisions, Clemen, R.T., PWS-Kent, 2 nd edition, 1996. 2. Decision making under Uncertainty, Holloway, C.A., Prentice Hall, 1979.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	25
	Quizzes	-	-
	Homeworks		
	Projects		
	Term Paper	X	25
	Laboratory Work		
	Other		
	Final Exam	X	50

Instructors	Prof. Dr. Ömer Faruk BAYKOÇ
Week	Subject
1	INTRODUCTION TO DECISION ANALYSIS: Decision analysis process, Elements of decision problem.
2	STRUCTURING DECISION: Influence diagram, Decision tree.
3	MAKING CHOICES: Decision making under uncertainty, Decision making under risk.
4	MAKING CHOICES: Risk profiles, Dominant alternatives.
5	COMPLEX DECISIONS and SIMULATION: Increasing uncertainty environments, Complex decisions
6	VALUE OF INFORMATION: Prior and posterior probabilities.
7	UTILITY THEORY: Expected utility, Certain equivalent, Risk premium.
8	MIDTERM EXAM I.
9	UTILITY THEORY: Assesment of utility function, Risk tolerance and exponential utility functions.

10	SENSITIVITY ANALYSIS: Two-way sensitivity analysis.
11	SENSITIVITY ANALYSIS: Sensitivity to probabilities, Strategy regions.
12	MULTIPLE CRITERIA DECISION MAKING: Goal programming.
13	MULTIPLE CRITERIA DECISION MAKING: Analytic hierarchy process.
14	GAME THEORY: Two person-zero sum games.

IE 547 FUZZY SET THEORY								INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching and Learning Methods (Hours per Semester)**							**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**		**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**40**		**106**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Introduction to fuzzy set theory, basics of fuzzy sets, fuzzy measures, fuzzy logic, applications of fuzzy set theory.
Course Objectives	The concept of fuzziness and linguistic variables, the special place of fuzziness in the other types of uncertanities, mathematical expression of fuzziness. Fundemantals of optimization,.knowledge of mathematical, engineering and scientific principles that underlie the basic application areas of industrial engineering.
Learning Outcomes and Competences	Be able to apply knowledge of science and engineering, be able to identify, formulate and solve engineering problems.
Text books and/or References	1.H. J. Zimmermann,(1986), Fuzzy Sets, Decision Making, and Expert Systems, Kluwer, (Ders kitabı) 2.C. S. Chen, (1992), Fuzzy Multiple Attribute Decision Making: Methods and Applications, Spiringer.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	30
	Homeworks	-	-
	Projects		
	Term Paper	X	20
	Laboratory Work	-	-
	Other		
	Final Exam	X	50

Instructors	Prof. Dr. Zülal GÜNGÖR, Assist.Prof.Dr. Feyzan ARIKAN ÖKTEMER
Week	Subject

1	Introduction
2	Conceptual Definition of Fuzzy Set Theory and Fuzziness
3	Fundemental Mathematical Descriptions in Fuzzy Set Theory: Fuzzy Set, Membership Function, Set Theoretic Operations
4	Diffrence between Clasical Sets and Fuzzy Sets
5	Difference between Probability ans Fuzziness
6	Application Areas of Fuzzy Set Theory
7	Fuzzy Mathematical Programming, Definition of Fuzzy Decision
8	Fuzzy Linear Programming and Fuzzy Goal Programming Approaches
9	MIDTERM EXAM
10	Werner's Approach, Verdegay's Approach
11	Parametric Approaches, Interactive Approaches
12	Fuzzy Operators, Mathematical Models constructed by using Different Fuzzy Operators
13	Project Presentations
14	Project Presentations

IE 550 MULTIOBJECTIVE OPTIMIZATION								INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching and Learning Methods (Hours per Semester)**							**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**		**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**45**		**101**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Compulsory
Prerequisites	None
Course Contents	An introduction to multicriteria decision making, fundemantals of multicriterion optimization, formulation of multiobjective optimization, multiobjective programming approach, goal programming approach, compromise programming, electre approach, applications in production management and other related areas.
Course Objectives	To introduce multicriteria decision making, fundemantals of multicriterion optimization,.knowledge of mathematical, engineering and scientific principles that underlie the basic application areas of industrial engineering.
Learning Outcomes and Competences	Be able to apply knowledge of science and engineering, be able to identify, formulate and solve engineering problems.
Text books and/or References	1. M. T. Tabucanon, (200), Multiple Criteria Decision Making, Elsevier. (Ders kitabı) 2. B. Roy, M. R. McCord, (200), Kluwer Academic Publishers. 3. J. P. Ignizio, Linear Programming in Single and Multiple Objective Systems, Prentice Hall.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	30
	Homeworks	-	-
	Projects		
	Term Paper	X	20
	Laboratory Work	-	-
	Other		
	Final Exam	X	50

Instructors	Prof. Dr. Zülal GÜNGÖR
Week	Subject
1	Multiple criteria decision making- Balancing a variety of needs and goals
2	Introduction and Definition of multiple criteria
3	Conflicting criteria, Definitions
4	Formulations
5	Concept of efficient solutions
6	Concept of weighting, ranking and rating
7	Techniques-single objective approach-global criterion method
8	Midterm
9	Minimum deviation methods, compromise constrained methods
10	Goal programming ElectreI, ElectreII, ElectreIII.
11	Step method -Interactive methods
12	Student Project presentation

13	Student Project presentation
14	Student Project presentation

IE 551 LOJISTICS MANAGEMENT									INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching and Learning Methods (Hours per Semester)**								**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Homeworks**	**Term Paper**	**Other**	**Total**	**Lecture**	**Recit.**
1	**42**	**-**	**-**	**-**	**30**	**40**	**76**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Logistics and logistics management, concepts of procurement, manufacturing and distribution logistics, supply chain management, relationship between supply chain and logistics, logistics and transportation as an integrated supply chain, logistics network design, inventory management, distribution systems and distribution strategies, logistics strategies, logistics planning, process of solving logistics problems and applications, outsourcing, third-party and fourth-party logistics, role and requirement of information technology in logistics and supply chain management, supply chain management and logistics case studies.
Course Objectives	Logistics management in supply chain; Supply production and distribution logistics problems and their solutions.
Learning Outcomes and Competences	The ability of making logistics system design and the ability of appliying the information technology to logistic systems.
Text books and/or References	1. Stock, J.R., Lambert, M.D., Startegic Logistics Management, McGraw-Hill, Irwin,2002. 2. Christopher, M., Logistics&Supply Chain Management: creating value-adding Networks, Printice Hall, 2005. 3. Langevin, A., Riopel, D., Logistics Systems: Design and Optimization, Springer, 2005.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	15
	Projects	-	-
	Term Paper	X	20
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	35

Instructors	Prof.Dr. Serpil EROL
Week	Subject
1	Logistics and logistics managent
2	Concepts of supply, production and distribution
3	Relation between supply chain management and logistics
4	Logistics and transportation
5	Design of logistics network

6	Structure of the distribution systems and distribution strategies
7	Case studies
8	Midterm
9	Logistic strategies, logistics planning
10	Solution approaches to logistics problems and applications
11	Outsourcing
12	3rd party and 4th party logistics
13	Use of the IT in logistics
14	Case studies

IE 552 INFORMATION SYSTEMS					INDUSTRIAL ENGINEERING DEPARTMENT				
Semester	**Teaching and Learning Methods (Hours per Semester)**							**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Homeworks**	**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**-**	**39**	**107**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Introduction to information systems, Data processing and Management information systems, Database management systems, System development tools, Decision support systems, Office automation systems, Executive information systems, Artificial intelligence and expert systems.
Course Objectives	To give general information about information technologies and its trends. To teach information system types such as decision support systems, Office automation systems, Executive information systems, Artificial intelligence and expert systems. To teach system development tools (including database design). To discuss some advanced topics on information systems.
Learning Outcomes and Competences	Understanding of information technology and some advanced topics on information systems, Gaining knowledge of how a new information system (including database design) will be developed
Text books and/or References	1. Mcleod, R., Schell,G., (2001), Management Information System., Eighth edition, Prentice Hall, NJ. (Textbook) 2. Turban, E., Aronson, J.E and Liang, T.P. (2005), Decision Support Systems and Intelligent Systems, Seventh edition, Prentice Hall, NJ.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	20
	Projects	-	-
	Term Paper	-	-
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	50

Instructors	Prof.Dr. Hadi GÖKÇEN
Week	Subject
1	INTRODUCTION TO INFORMATION SYSTEMS: Information, System and system concepts, Managerial decision making, Information systems
2	COMPUTER BASED INFORMATION SYSTEMS: Data processing systems, Management information systems and related topics.
3	COMPUTER BASED INFORMATION SYSTEMS: Decision support systems, Office automated

	systems, Artificial intelligence and expert systems, Executive support systems.
4	INFORMATION SYSTEM DEVELOPMENT TOOLS: Flowcharts, Data flow diagrams.
5	INFORMATION SYSTEM DEVELOPMENT TOOLS: Structured chart, Structured English, Decision tables, Decision trees, HIPO
6	*DATABASE DESIGN AND MANAGEMENT: Data sources and data management, Database models, Database components.*
7	DATABASE DESIGN AND MANAGEMENT: Relational database design
8	SYSTEM DEVELOPMENT APPROACHES : System development life cycle (SDLC)
9	SYSTEM DEVELOPMENT APPROACHES: System development life cycle (SDLC),Prototyping, Application software packages, End user development, CASE (Computer Aided System/Software Engineering) tools, Object oriented methodology, Hybrid methodology.
10	*COMMUNICATION AND NETWORK SYSTEMS: Network topologies, Communication network types.*
11	INTERNET AND ELECTRONIC COMMERCE; Internet, Intranet and extranet, Electronic commerce and related concepts, Information system project discussion
12	INFORMATION SYSTEM SECURITY AND ETHIC : Computer crimes, Ethical implications and legal regulations, Information system project discussion
13	INFORMATION SYSTEM PROJECT DISCUSSION
14	INFORMATION SYSTEM PROJECT DISCUSSION

IE 555 STORAGE AND DISTRIBUTION SYSTEMS									INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching and Learning Methods (Hours per Semester)**								**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Homeworks**	**Term Paper**	**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**-**	**35**	**45**	**66**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Planning, design, and analysis of storage and distribution systems; conventional versus automated methods; assessing and optimizing system performance; heuristic dispatching algorithms; packaging and bundling; vehicle routing algorithms; fleet design; global issues in storage and distribution; web based approaches.
Course Objectives	Design of the storage and distribution systems for conventional or automatic systems, teaching and implementation of methods for performance evaluation of the designed systems.
Learning Outcomes and Competences	Ability of designing of the storage and distribution systems for all systems.
Text books and/or References	1. Martin A.J. Distribution Research Planning : The Gateway to true Quick Response and Continual Replenishment, John Wiley and Sons, NewYork, 1995. 2. Bowesox D.J., Closs, D.J., Cooper, M.B., Supply Chain Logistics Management, Mc Graw Hill, 2002. 3. Ballou, R.H. Business Lojistics/Supply Chain Management, Prentice Hall, 2004. 4. Murty, K.G., Network Programming, Prentice Hall, 1992. 5. Glover, F., Klingman, D., Phillips, N.V., Network Models in Optimization and Their Applicayions in Practice, John VViley and Sons, 1992. 6. Ahuja, R.K., Magnantı, T., Orlin, J., Network Flows, Prentice Hall, 1993.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	15
	Projects	-	-
	Term Paper	X	25
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	30

Instructors	Prof.Dr.Serpil EROL, Prof.Dr. Ertan GÜNER, Assist.Prof.Dr. Murat ARIKAN
Week	Subject
1	Basic concepts in storage and distribution
2	Conventional storage and distribution systems
3	Automatic storage and distribution systems
4	Design and analysis of the storage and distribution systems
5	Planning of the storage and distribution systems

6	Determination and analysis of the performance of the storage and distribution systems
7	Optimization of the performance of the storage and distribution systems
8	Midterm
9	Heuristic distribution algorithms
10	Packing methods
11	Vehicle routing
12	Vehicle routing algorithms
13	Fleet design and management
14	Global subjects on storage and distribution

IE 556 SPECIAL TOPICS IN MODERN MANUFACTURING									INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching and Learning Methods (Hours per Semester)**								**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Homeworks**	**Term Paper**	**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**-**	**28**	**35**	**83**	**188**	**3**	**7.5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Design and performance analysis of modern manufacturing systems: cellular manufacturing systems, automated material-handling and storage systems; concurrent engineering implementations, robotic systems, flexible manufacturing systems, computer integrated manufacturing. Various papers and references are presented related to FMS and CIM. State of-the-art papers are discussed. Also recycling and remanufacturing implementations are discussed.
Course Objectives	To promote interest in modern manufacturing systems. To present various papers and references related to Cellular Manufacturing Systems, Automated Material Handling-Storage Systems, Robotic Systems, FMS and CIM. To discuss state of-the art papers.
Learning Outcomes and Competences	Learning the latest topics and methods in manufacturing systems. To get an ability for implementing proper methods to solve the problems occurred in these areas.
Text books and/or References	1. Mikell Groover., Automation, Production Systems and Computer- Integrated Manufacturing, Prentice Hall, 2001. 2. Singh Nanua., System Approach to To Computer- İntegrated Design and Manufacturing, John Wiley Sons, 1996. 3. Rehg, J., Kraebber, H., Computer Integrated Manufacturing, Prentice Hall, 2004. 4. Rembold, U., Nnaji, B.O., Storr, A., Computer Integrated Manufacturing and Engineering,Addison-wesley publishing Company, 1993 5. Cornelius Leondes, Computer-Aided Design, Engineering and Manufacturing: Systems Techniques and Applications, 2000.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	25
	Quizzes	-	-
	Homeworks	X	15
	Projects	-	-
	Term Paper	X	20
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	40

Instructors	Prof.Dr. Ertan GÜNER, Assist.Prof.Dr.Ediz Atmaca
Week	Subject
1	INTRODUCTION: Design and manufacturing: a historical perspective, changing concepts of manufacturing management
2	CONCURRENT ENGINEERING: What is Concurrent engineering?, sequential engineering

	versus concurrent engineering, mathematical model for understanding interactions between design and manufacturing, difficulties associated with performing concurrent engineering, concurrent engineering techniques.
3	COMPUTER CONTROL OF MANUFACTURING SYSTEMS: automation, numerical control, programming for nümerical control, adaptive kontrol, sensor teknology.
4	MATERIAL HANDLING SYSTEMS: overview of material handling equipment; the 10 principles of material handling, industrial trucks, automated guided vehicle systems, conveyor systems, analysis of material transport systems.
5	WAREHOUSING: STORAGE AND RETRIEVAL SYSTEMS AND IDENTIFICATION TECHNOLOGIES: storage system performance, storage location strategies, automated storage systems, overview of automatic identification methods, bar code teknology, other automatic data capture.
6	ROBOTIC SYSTEMS: fundamentals of robotics and robotics technology, robotic joints, robot classification robot motion analysis , robot applications , sequencing of robot moves in robotic cells.
7	JUST IN TIME MANUFACTURING: Toyoto production system, pull versus push system, types of kanbans, Kanban planning and control models, sinyal kanban, JIT purchasing, potential benefits of JIT implementation.
8	MIDTERM EXAM I,
9	GROUP TECHNOLOGY AND CELLULAR MANUFACTURING SYSTEMS: What is Group technology, design attributes and manufacturing features, GT implementation, visual inspection method, coding methods, the OPITZ sınıflandırma sistemi, part family formation:claddification and coding system, selection of classification and coding systems, benefits of group technology.
10	GROUP TECHNOLOGY AND CELLULAR MANUFACTURING SYSTEMS: what is cellular manufacturing?, cell formation approaches: machine-compenent group analysis, similarity coefficient-based approaches, exceptional parts and bottleneck machines, evaluation of cell designsn , mathematical programming models, production planning and control in cellular manufacturing systems, an integrated GT and MRP framework..
11	FLEXİBLE MANUFACTURİNG SYSTEMS, COMPUTER INTEGRATED MANUFACTURING: basic features of physical and control components of an FMS, operational problems in FMS, introduction to CIM and enterprise-wide integration.
12	FUTURE DIRECTIONS ON MANUFACTURING SYSTEMS: Knowledge-Based Manufacturing Management, overview of basic principles and techniques of knowledge representation..
13	MIDTERM EXAM II
14	FUTURE DIRECTIONS ON MANUFACTURING SYSTEMS:a state of the art survey on current and future directions of manufacturing technology.

IE - 557 MULTI-CRITERIA DECISION MAKING						INDUSTRIAL ENGINEERING DEPARTMENT				
Semester	**Teaching and Learning Methods (Hours per Semester)**								**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Homeworks**	**Term Paper**	**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**25**	**18**	**23**	**80**	**188**	**3**	**7,5**

Language	Turkish
Compulsory Elective	Elective
Prerequisites	None
Course Contents	Introduction to decision making, Decision making under uncertainty&under risk, Decision trees, Structuring the decision making problem, Multi-criteria decision making methods, Basic methods, Interaction methods, Outranking methods, Value based methods.
Course Objectives	The objective of this course is to provide students practical MCDM techniques and structuring of the decision making process those help them to think clearly about objectives, criteria, alternatives.
Learning Outcomes and Competences	This course provide students to improve the quality of the decisions they make in organizational and personal decisions. As a consequence it is planned to improve students' decision making skills, their ability to analyze problems systematically, and their confidence in their own decision making.
Text books and/or References	1-) Bazerman, M.H. 2002. Judgment in Managerial Decision Making. 5.Ed., John Wiley & Sons, New York. 2-) Belton, V., Stewart, T.J. 2003. Multiple Criteria Decision Analysis: An Integrated Approach, Kluwer Academic Publishers, Dordrecht. 3-) Doumpos, M., Zopounidis, C. 2002. Multicriteria Decision Aid Classification Methods, Kluwer Academic Publishers, Dordrecht. 4-) Saaty T.L. 1990. Multicriteria Decision Making: the Analytic Hierarchy Process, RWS Publications, Pittsburgh. 5-) Vincke, Ph., 1992. Multi Criteria Decision Aid. John Wiley & Sons, Inc., West Sussex. 6-) Yoon, K.P. and Hwang C-L., 1995. Multi Attribute Decision Making: An Introduction. Sage University Papers Series, Quantitative Applications in the Social Sciences, No 07-104, Sage Pubn., London.

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	-	-
	Projects	-	-
	Term Paper	X	20
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	50

Instructors	Assoc.Prof.Dr. Metin DAĞDEVİREN
Week	Subject

1	Introduction: Basic concepts, system approach
2	Decision making under uncertainty&risk
3	Structuring the decision making problems: Decision hierarchy, decision network, decision trees Multi
4	criteria decision making methods: Basic methods
5	Multi criteria decision making methods: Interaction methods
6	Multi criteria decision making methods: Outranking methods
7	Multi criteria decision making methods: Outranking methods (continued)
8	Midterm exam
9	Multi criteria decision making methods: Value based methods
10	Multi criteria decision making methods: Value based methods (continued)
11	Multi criteria decision making methods: Value based methods (continued)
12	Students' projects presentations
13	Students' projects presentations
14	Students' projects presentations

IE - 546 DESIGN OF EXPERIMENTS						INDUSTRIAL ENGINEERING DEPARTMENT				
Semester	**Teaching and Learning Methods (Hours per Semester)**								**Credits**	
	Lecture	**Recit.**	**Lab.**	**Project/ Field Study**	**Homeworks**	**Term Paper**	**Other**	**Total**	**Local Credit**	**ECTS Credit**
1	**42**	**-**	**-**	**-**	**26**	**40**	**80**	**188**	**3**	**7,5**

Language	Turkish
Compulsory Elective	Compulsory
Prerequisites	None
Course Contents	Basic concepts and methods of experimental design. Single and multiple regression analysis, analysis of variance. Single factor experiments. Random block design and Latin square. Factorial design, fixed effect model, random and mixed models. Applications.
Course Objectives	Providing the students with statistical methods which are used in product development, total quality management, etc., and used to increases reliability of the results in scientific studies.
Learning Outcomes and Competences	An ability to design and conduct experiments, as well as to analyze and interpret data. An ability to design a system, component, or process to meet desired needs within realistic. An ability to get and interpret results in designed experiments by using a statistical package program.
Text books and/or References	1. Montgomery D.C., (2005), Design and Analysis of Experiments, 6th Edition, John Wiley & Sons 2. Antony, J., (2003) Design of Experiments for Engineers and Scientists, 6th Edition, Butterworth-Heinemann

Assessment Criteria		**If any,mark as (X)**	**Percentage**
	Midterm Exams	X	30
	Quizzes	-	-
	Homeworks	X	15
	Projects	-	-
	Term Paper	X	20
	Laboratory Work	-	-
	Other	-	-
	Final Exam	X	35

Instructors	Prof.Dr. Fulya Altıparmak
Week	Subject
1	Experimental design principles for the design example
2	Experiments with Single Factors: Variance analysis of the logic (ANOVA)
3	Averaging testing After ANOVA, confidence intervals, variance components Experiments with a
4	Single factor completed random blocks design
5	Incomplete blocks design
6	Experiments with a single factor Latin square design, and other squares design,
7	Midterm
8	Factorial Experiments
9	Factorial Experiments

10	Restrictions are placed on the randomization in Factorial Experiments
11	2^k Factorial Experiments
12	2^k Factorial Experiments
13	Confounding in blocks
14	Fractional replication experiments

5980007 SEMINAR								INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching Methods**							**Credits**	
	Seminar	**Library Studies**	**Project Presentation**			**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	28	80	80				188	0	7.5

Language	Turkish
Compulsory / Elective	Compulsory
Prerequisites	Assignment of the supervisor
Course Contents	Presentation of the thesis work
Course Objectives	• To give the ability of the oral presentation and discussion • To decide on the objectives of the thesis work and the strategy
Learning Outcomes and Competences	• To have the ability of the oral presentation and discussion • To have an ability of determining the objectives and the strategy of a scientific work
Textbook and /or References	All the references related to the study.

Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Seminar	X	
	Quizzes		
	Homeworks		
	Projects / Presentation	X	
	Term Paper		
	Laboratory/ Library Work	X	
	Other		
	Final Exam		

Instructors	The supervisor

5001007 MS Thesis								INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching Methods**							**Credits**	
	Meeting		**Recitation/ Lab.**			**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	14		200			36	250	0	10
Language	Turkish								
Compulsory / Elective	Compulsory								
Prerequisites	Assignment of the supervisor								
Course Contents	MS thesis work								
Course Objectives	To improve the ability of getting the scientific information, its evaluation and interpretation by conductive scientific research								
Learning Outcomes and Competences	• To have the ability of getting the scientific and technological information, and engaging in life-long learning • To have the ability of evaluation and interpretation								
Textbook and/or References	All the references related to the study.								
Assessment Criteria								***If any,mark as (X)***	**Percent (%)**
	Midterm Exams								
	Quizzes								
	Homeworks								
	Projects								
	Term Paper								
	Laboratory and Library Work / Applications							X	
	Other (Report, presentation)							X	
	Final Exam								
Instructors	The supervisor								

6001007 PhD Thesis								INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching Methods**							**Credits**	
	Meeting		**Recitation/ Lab.**			**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	14		200			36	250	0	10

Language	Turkish
Compulsory / Elective	Compulsory
Prerequisites	Assignment of the supervisor
Course Contents	PhD thesis work
Course Objectives	• To give the ability of carrying out independent research, • To give the ability of deducing conclusions scientifically • To give the ability of determining progressive steps to reach new synthesis
Learning Outcomes and Competences	To gain ability for innovations in scientific approach or to develop a new scientific method or to apply obvious method to a new field.
Textbook and /or References	All the references related to the study.

Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams		
	Quizzes		
	Homeworks		
	Projects		
	Term Paper		
	Laboratory and Library Work / Applications	X	
	Other (Report, presentation)	X	
	Final Exam		

Instructors	The supervisor

7001007TERM PROJECT							INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching Methods**						**Credits**	
	Meeting	**Recitation/ Lab./ Library**			**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	70	300			68	438	0	17.5

Language	Turkish		
Compulsory / Elective	Compulsory		
Prerequisites	Assignment of the supervisor		
Course Contents	A theoretical and practical assay in which technical know how gained in professional discipline are applicable		
Course Objectives	To acquaint in a certain field and to teach how to apply.		
Learning Outcomes and Competences	Getting an ability to apply the knowledge obtained during education		
Textbook and /or References	All the references related to the study.		
Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams		
	Quizzes		
	Homeworks		
	Projects / Presentation	X	
	Term Paper		
	Laboratory/ Library Work / Applications	X	
	Other	X	
	Final Exam		
Instructors	The supervisor		

8000007 DOCTORAL QUALIFYING EXAMINATION								INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching Methods**							**Credits**	
	Individual work					**Other**	**Total**	**Credit**	**ECTS Credit**
I-II	400					38	438	0	17.5

Language	Turkish		
Compulsory / Elective	Compulsory		
Prerequisites	To complete the minimum course credit		
Course Contents	The written and oral exams on basic subjects and related fields of the PhD thesis work		
Course Objectives	To check the qualification on basic subjects and related fields of the PhD thesis work		
Learning Outcomes and Competences	To have the qualification on basic subjects and related fields of the PhD thesis work		
Textbook and /or References	All the references related to the study.		
Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams		
	Quizzes		
	Homeworks		
	Projects		
	Term Paper		
	Laboratory Work		
	Other		
	Qualıfying Exam		
Instructors	Qualification committee		

8500007 PROGRESS IN THESIS								INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching Methods**							**Credits**	
	Report, Presentation	**Measurement and evaluation**				**Other**	**Total**	**Credit**	**ECTS Credit**
I-II	40	100				48	188	0	7.5

Language	Turkish		
Compulsory / Elective	Compulsory		
Prerequisites	Passing the qualification exam		
Course Contents	Developing the research work		
Course Objectives	To analyse the results obtained according to the work plan of PhD studies and make the work plan for the next period and contributing to the direction of the PhD work.		
Learning Outcomes and Competences	To get an ability of making work plans on the basis of research objective and evaluating the results and presentation.		
Textbook and /or References	All the references related to the study.		
Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams		
	Quizzes		
	Homework		
	Projects		
	Term Paper		
	Laboratory Work		
	Report and presentation	X	
	Final Exam		
Instructors	Thesis committee		

80*07DD SPECIAL TOPICS in MS								INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching Methods**							**Credits**	
	Theory	**Library/Lab./ Homework**		**Project / Area studies**		**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	42	150		30		28	250	0	10

Language	Turkish
Compulsory / Elective	Compulsory
Prerequisites	Assignment of the supervisor
Course Contents	Basic concepts and applications related to the thesis work
Course Objectives	• To give the general knowledge related to the thesis work • To develop the ability of analytical thinking
Learning Outcomes and Competences	• To have the general knowledge • To have the ability of making plans for the research work
Textbook and /or References	All the references related to the study.

Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams		
	Quizzes		
	Homeworks		
	Projects / presentation	X	
	Term Paper		
	Laboratory / Library Work	X	
	Other		
	Final Exam		

Instructors	The supervisor

90*07DD SPECIAL TOPICS in PhD							INDUSTRIAL ENGINEERING DEPARTMENT	
Semester	**Teaching Methods**						**Credits**	
	Theory	**Library/Lab./ Homework**		**Project / Area studies**		**Other**	**Total**	**Credit**	**ECTS Credit**
1-2	42	150		30		28	250	0	10

Language	Turkish		
Compulsory / Elective	Compulsory		
Prerequisites	Assignment of the supervisor		
Course Contents	Basic concepts and applications related to the thesis work		
Course Objectives	• To give the general knowledge related to the thesis work • To develop the ability of analytical thinking		
Learning Outcomes and Competences	• To develope the ability of analytical thinking • To get the ability of evaluation, data analysis and making written/oral presentation		
Textbook and /or References	All the references related to the study.		
Assessment Criteria		***If any,mark as (X)***	**Percent (%)**
	Midterm Exams		
	Quizzes		
	Homeworks		
	Projects / Presentation	X	
	Term Paper		
	Laboratory / Library Work	X	
	Other		
	Final Exam		
Instructors	The supervisor		