INDUSTRIAL ENGINEERING PhD PROGRAMME

First Year						
I. Semester						
Code	Course Title	ECTS	T+P	Credit	C/E	Language
501001101	THE SCIENTIFIC RESEARCH METHODS AND ITS ETHICS	7.5	3+0+0	3	**C**	Turkish
503201505	STOCHASTIC PROCESSES	7.5	3+0+0	3	**C**	Turkish
	Elective Course-1	7.5	3+0+0	3	E	Turkish
	Elective Course-2	7.5	3+0+0	3	E	Turkish
	Total of I. Semester	30		12		
II. Semester						
Code	Course Title	ECTS	T+P	Credit	C/E	Language
	Elective Course-3	7.5	3+0+0	3	E	Turkish
	Elective Course-4	7.5	3+0+0	3	E	Turkish
	Elective Course-5	7.5	3+0+0	3	E	Turkish
503212001	PhD Seminar	7.5	0+1+0	-	**C**	Turkish
	Total of II. Semester	30		9		
	TOTAL OF FIRST YEAR	60		21		

Second Year						
III. Semester						
Code	Course Title	ECTS	T+P	Credit	C/E	Language
503211801	PhD PROFICIENCY	30	0+1+0	-	**C**	Turkish
	Total of III. Semester	30	0+1+0			
IV. Semester						
Code	Course Title	ECTS	T+P	Credit	C/E	Language
503211802	PhD THESIS STUDY	25	0+1+0	-	**C**	Turkish
503211803	SPECIALIZATION FIELD COURSE	5	3+0+0	-	**C**	Turkish
	Total of IV. Semester	30				
	TOTAL OF SECOND YEAR	60				

Third Year						
V. Semester						
Code	Course Title	ECTS	T+P	Credit	C/E	Language
503211802	PhD THESIS STUDY	25	0+1+0	-	**C**	Turkish
503211803	SPECIALIZATION FIELD COURSE	5	3+0+0	-	**C**	Turkish
	Total of V. Semester	30				
VI. Semester						
Code	Course Title	ECTS	T+P	Credit	C/E	Language

503211802	PhD THESIS STUDY	25	0+1+0	-	C	Turkish
503211803	SPECIALIZATION FIELD COURSE	5	3+0+0	-	C	Turkish
	Total of Spring Semester	30				
	TOTAL OF THIRD YEAR	60				

Fourth Year						
VII. Semester						
Code	Course Title	ECTS	T+P	Credit	C/E	Language
503211802	PhD THESIS STUDY	25	0+1+0	-	C	Turkish
503211803	SPECIALIZATION FIELD COURSE	5	3+0+0	-	C	Turkish
	Total of VII. Semester	30				
VIII. Semester						
Code	Course Title	ECTS	T+P	Credit	C/E	Language
503211802	PhD THESIS STUDY	25	0+1+0	-	C	Turkish
503211803	SPECIALIZATION FIELD COURSE	5	3+0+0	-	C	Turkish
	Total of VIII. Semester	30				
	TOTAL OF FOURTH YEAR	60				

Elective Courses						
Code	Course Title	ECTS	T+P	Credit	C/E	Language
503201514	APPLIED METHODS IN ERGONOMICS	7.5	3+0+0	3	E	Turkish
	DECISION MAKING FOR DEFENSE AND SECURITY SYSTEMS	7.5	3+0+0	3	E	Turkish
503201510	DECISION SUPPORT SYSTEMS AND EXPERT SYSTEMS	7.5	3+0+0	3	E	Turkish
503202512	DESIGN TOOLS FOR SIX SIGMA	7.5	3+0+0	3	E	Turkish
503202501	EXPERIMENTAL PLANNING	7.5	3+0+0	3	E	Turkish
503212604	GENETIC ALGORITHMS	7.5	3+0+0	3	E	Turkish
503211602	GROUP TECHNOLOGY AND FLEXİBLE MANUFACTURİNG SYSTEMS	7.5	3+0+0	3	E	Turkish
	HUMAN MACHİNE INTERACTİON	7.5	3+0+0	3	E	Turkish
503212601	INTEGER PROGRAMMING	7.5	3+0+0	3	E	Turkish
503201511	INVENTORY CONTROL	7.5	3+0+0	3	E	Turkish
503202508	INVESTMENT PROJECTS EVALUATION	7.5	3+0+0	3	E	Turkish
503201503	LINEAR PROGRAMMING	7.5	3+0+0	3	E	Turkish
503201507	LOCATION MODELS	7.5	3+0+0	3	E	Turkish
503201502	MANUFACTURING RESOURCE PLANNING	7.5	3+0+0	3	E	Turkish
503202509	MATERIALS HANDLING AND WAREHOUSE SYSTEMS	7.5	3+0+0	3	E	Turkish
503212603	MULTIOBJECTIVE PROGRAMMING	7.5	3+0+0	3	E	Turkish
503212602	NETWORK FLOW THEORY	7.5	3+0+0	3	E	Turkish
503202506	PERSONNEL EVALUATION	7.5	3+0+0	3	E	Turkish
	PROBABILITY THEORY AND STATISTICS	7.5	3+0+0	3	E	Turkish
	PRODUCT AND PROCESS DEVELOPMENT	7.5	3+0+0	3	E	Turkish

503201513	RELIABILITY ANALYSIS	7.5	3+0+0	3	E	Turkish
503202502	SCHEDULING	7.5	3+0+0	3	E	Turkish
503201515	SIMULATION MODELLING	7.5	3+0+0	3	E	Turkish
503201512	STATISTICS AND SIX SIGMA APPROACH	7.5	3+0+0	3	E	Turkish
503212901	STOCHASTIC PROCESSES	7.5	3+0+0	3	E	English
503202510	SUPPLY CHAIN MANAGEMENT	7.5	3+0+0	3	E	Turkish
503212605	TAGUCHI METHODS	7.5	3+0+0	3	E	Turkish
503201501	TOTAL QUALITY MANAGEMENT	7.5	3+0+0	3	E	Turkish

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Fall

COURSE			
CODE	503201502	TITLE	Manufacturing Resource Planning

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3	0	0	3	7.5	COMPULSORY (x)	ELECTIVE ( )	Turkish

CREDIT DISTRIBUTION		
Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
	5	95

ASSESSMENT CRITERIA			
	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	1	35
	Quiz		
	Homework		
	Project	1	30
	Report		
	Seminar		
	Other ( )		
	Final Examination		35

PREREQUISITE(S)	
SHORT COURSE CONTENT	Manufacturing Resource Planning, Aggregate Planning, Master Production Sceheduling, MRP, CRP, JIT
COURSE OBJECTIVES	To introduce Manufacturing Resource Planning and related operations and to give information about how to do them.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	To teach which (and how) operations are performed for Manufacturing Resource Planning in a production environment.
LEARNING OUTCOMES OF THE COURSE	Ability to determine, define, formulate and solve complex engineering problems; for that purpose an ability to select and use convenient analytical and experimental methods
TEXTBOOK	Thomas E. Vollmann, William L. Berry, D. Clay Whybark, Manufacturing Planning and Control Systems, Irwin/McGraw-Hill, 1997, 4th edition
OTHER REFERENCES	Khalid Sheikh, Manufacturing Resource Planning (Mrp Ii): With Introduction to Erp, Scm and Crm, McGraw-Hill Professional Engineering Series, 2003

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Manufacturing, Manufacturing Resources, Planning, Introduction
2	Manufacturing Resource Planning
3	Aggregate Planning
4	Master Production Sceheduling
5	Roughcut Capacity Planning
6	Midterm Examination 1
7	Material Requirement Planning (MRP)
8	MRP, Lot sizing, Optimal lot size
9	Capacity Requirement Planning (CRP)
10	Just in Time (JIT)
11	Midterm Examination 2
12	Project presentation
13	Project presentation
14	Project presentation
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☒	☐	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☐	☒	☐
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☐	☒	☐
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☒	☐	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☒	☐	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☐	☐	☒
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☒	☐
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☒
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☐	☒
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☐	☒	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☐	☒	☐

Prepared by : Doç.Dr. Şerafettin ALPAY **Date:** September,2015

Signature:

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GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Fall

COURSE			
CODE	503201503	TITLE	Linear Programming

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3	0	0	3	7,5	COMPULSORY (x)	ELECTIVE ( )	Turkish

CREDIT DISTRIBUTION		
Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
	x	

ASSESSMENT CRITERIA			
	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	1	30
	Quiz		
	Homework	1	30
	Project		
	Report		
	Seminar		
	Other ( )		
	Final Examination		40

PREREQUISITE(S)	
SHORT COURSE CONTENT	Linear programming examples, convex analysis and polyhedral sets, Simplex algorithm, initial solution techniques, revised Simplex algorithm, Karush-Kuhn-Tucker optimality conditions, duality, sensitivity analysis, dual Simplex algorithm, primal-dual algorithm, complexity and Karmarkar algorithm. Solving linear programming models by using software such as Lingo or Gams and interpretation of solution reports.
COURSE OBJECTIVES	The main aim of this course is to give information about convex analysis, fundamentals of linear programming and solution techniques of linear programming.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	By the end of this module students will be able to modeling and solving of linear programming problems by using LINGO and GAMS.
LEARNING OUTCOMES OF THE COURSE	Notification about the modelling and solving of linear decision problems, application of modellling and solving of real life problems, comments of solution reports obtained by GAMS or LINGO, anayzing of different solution methods.
TEXTBOOK	1. Bazaraa M.S., Jarvis J.J., Sherali H.D., 1990, Linear Programming and Network Flows 2nd ed., John Wiley & Sons, 684 p.
OTHER REFERENCES	1. Rardin R.L., 1998, Optimization in Operations Research, Prentice Hall, 919 p. 2. Castillo E., Conejo A.J., Pedregal P., Garcia R., Alguacil N., 2002, Building and Solving Mathematical Programming Models in Engineering and Science, Wiley, 546 p

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	LINGO, linear programming modeling and examples
2	GAMS
3	Geometric Solution, Requirement Space, Vectors
4	Matrices, Convex sets , Convex functions, Extreme Points, Extreme Directions
5	The Simplex Method
6	Midterm Examination 1
7	Starting Solution (Techniques used artificial variable)
8	The Karush-Khun-Tucker Optimality Conditions
9	Duality and Dual Simpleks Method
10	Sensitivity Analysis
11	Midterm Examination 2
12	The Decomposition Principle
13	The Interior Point Method
14	The Simpleks Method for Network Problems
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☐	☐	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☐	☐	☒
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☐	☐	☐
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☐	☐	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☒	☐	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☐	☐	☐
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☐	☐
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☐
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☐	☐
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☐	☐	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☐	☐	☐

Prepared by : Assit.Prof.Dr.Tuğba Saraç **Date:** 12.10.2015

Signature:

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ESKISEHIR OSMANGAZI UNIVERSITY
GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Fall

COURSE			
CODE	503201501	TITLE	TOTAL QUALITY MANAGEMENT

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3	-	-	3	7.5	COMPULSORY ( )	ELECTIVE (X)	Turkish

CREDIT DISTRIBUTION

Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
1		2 √

ASSESSMENT CRITERIA

	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	2	50
	Quiz		
	Homework	1	15
	Project		
	Report		
	Seminar		
	Other ( )		
	Final Examination		35

PREREQUISITE(S)	None
SHORT COURSE CONTENT	The main topics of the course are as follows: Rewiev of quality, Economics of quality, Quality leaders, 14 Points of Dr. Deming, Rewiev of SPC, Total Quality Management, TQM in service sector,Employee involvement and team studies, Quality management system standards,
COURSE OBJECTIVES	To introduce the management side of TQM and related system standards
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	To understand TQM and related subjects, To develope and implement TQM systems in manufacturing and service environment.
LEARNING OUTCOMES OF THE COURSE	To understand TQM and system standards, To develope and implement quality cost system To develope and implement TQM in manufacturing and service systems To understand the national and international effects of TQM To understand the employee involvement in TQM studies
TEXTBOOK	Goetsch, D. L., Davis, S. B. (2000) : Quality Management –Introduction to Total Quality Management for Production, Processing, and Services, (3. Bası), Prentice-Hall, New Jersey
OTHER REFERENCES	1.Evans, J. R., Lindsay, W: M: (1989): The Management and Control of Quality, West Publishing Co., St. Paul, ABD, 2.Çetin, C., Akın,B., Erol,V. (2001) : Toplam Kalite Yönetimi ve Kalite Güvence Sistemi (ISO 9000:2000 Revizyonu) , Beta Yayınları, No : 1094,

	İstanbul, 3.Montgomery, D. C. (1997) : Introduction to Statistical Quality Control, (3. bası), John Wiley & Sons, Inc., NewYork, 4.Burnak, N. (1997) : Toplam Kalite Kontrolu : İstatistiksel Süreç Kontrolu, Osmangazi Üniv.,TEKAM yayın no:TS-97-008-NB, Eskişehir, 5.Grant, E. L., Leavenworth, R. S. (1988) : Statistical Quality Control, (6. bası), McGraw-Hill, Inc. NewYork, 6.Tan, S., Peşkircioğlu, N. (1991) : Kalitesizliğin Maliyeti, Milli Prodüktivite Merkezi, Yayın no: 316, Anakara, 7.Özenci, B. T. Cunbul, Ö. L. (1998): Kalite Ekonomisi, Türkiye Kalite Derneği Yayınları, No:2, İstanbul,

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Quality and Historical Background
2	Total Quality Management
3	Economics of Quality
4	Rewiev of Statistical Process Control
5	TQM at Service Sector
6	Midterm Examination 1
7	Presentations-1
8	Employee Involvement
9	Team Studies
10	Presentations-2
11	Midterm Examination 2
12	TQM and Planning
13	Presentations-3
14	TQM Models and ISO 9000-nnn System Standards
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		**CONTRIBUTION LEVEL**		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☐	☒	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☐	☐	☒
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☐	☐	☐
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☐	☐	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☐	☐	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☐	☐	☐
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☒	☐	☐
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☐
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☒	☐
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☐	☐	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☐	☐	☐

Prepared by : Prof. Dr. Nimetullah BURNAK **Date:** 19/06/15

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Fall

COURSE			
CODE	503201507	TITLE	Location Models

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3	0	-	3	7.5	COMPULSORY ( )	ELECTIVE (x)	Turkish

CREDIT DISTRIBUTION

Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
1	2	

ASSESSMENT CRITERIA

	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	1	20
	Quiz		
	Homework	2	20
	Project		
	Report	1	20
	Seminar		
	Other ( )		
	Final Examination		40

PREREQUISITE(S)	
SHORT COURSE CONTENT	The concepts of facilities, planning and design process; locational analysis; basic layout modes and layout of factories; systematical layout planning; gathering; analyzing; processing and converting of necessary data into layout plans; materials handling systems; computer aided layout techniques; mathematical models in layout planning; recent trends in layout planning
COURSE OBJECTIVES	The main aim of the course is to introduce the fundamental concepts related with space, place, location and position; to acquire an awareness of contribution of the location decisions into efficiency and effectiveness of production systems, recent trends in this field (fuzzy logic, artificial intelligence applications, etc.); to inform the genealogy of locational models and theoretical infrastructure of the problem; to expertise on retrieving, examining, evaluating and monitoring of the improvements in the field of locational analysis
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	structure of location problem and will know the current approaches, techniques and methods on this field; adapt the operational research concepts and techniques (especially modeling, artificial intelligence and computer aid) to location problems; assess the potential effects of recent improvements and trend of locational analysis onto efficiency and effectiveness of production systems; will be aware of the essential steps to prepare a scientific research and to write a technical paper.
LEARNING OUTCOMES OF THE COURSE	Integration of existing engineering formation, application of OR techniques to locational problems, .acquiring of an infrastructure to prepare papers, to introduce new techniques and trends.

TEXTBOOK	Francis R.L., Mc Ginnis Jr. R. L., White J. A. (1992) "Facility Layout and Location", Prentice Hall, USA
OTHER REFERENCES	Related papers and software

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Transportation, Handling, Location, Layout, Facilities Planning, Plane and Network Models
2	Economical and Technical Considerations, Solution Approaches
3	Constraints, Objectives and Distance Metrics
4	Fuzzy Models, Multi-Criterial Nature and MCDM
5	Taxonomy of Models
6	Midterm Examination 1
7	Industrial and Other Locations, Supply Chain Relations
8	Weber and Single Facility Locations
9	Multi Facility Location Problems
10	Location-Allocation Problems
11	Midterm Examination 2
12	Competitive Location Problems
13	Specific Location Problems
14	Trends
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☒	☐	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☒	☐	☐
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☐	☐	☒
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☐	☒	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☐	☒	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☐	☐	☒
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☐	☒
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☒
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☒	☐
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☐	☐	☒
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☐	☐	☒

Prepared by : Prof. Dr. A. Attila İŞLİER **Date:** 12. 06.2015

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Spring

COURSE			
CODE	503202502	TITLE	SCHEDULING

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3	0	0	3	5	COMPULSORY (X)	ELECTIVE ( )	TURKISH

CREDIT DISTRIBUTION

Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
0	1	2

ASSESSMENT CRITERIA

	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	1	30
	Quiz		
	Homework		
	Project	1	30
	Report		
	Seminar		
	Other ( )		
	Final Examination		40

PREREQUISITE(S)	
SHORT COURSE CONTENT	Introduction; Examples to scheduling problems, Models, notation, constraints, objectives. Problem classification. Problem complexity. Single Machine Scheduling, General purpose scheduling procedures and their application, Branch and Bound, Heuristic Methods, Flowshop, Parallel Machine Scheduling, Openshop, Jobshop, Scheduling Applications
COURSE OBJECTIVES	This course gives an introduction to a broad range of scheduling problems that arise in both manufacturing and service organizations. Efficient scheduling of operations will improve the performance of the systems.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	Provide a basic understanding of scheduling issues in services and manufacturing industry. Development of problem-solving ability and analytical thinking ability with respect to scheduling issues.
LEARNING OUTCOMES OF THE COURSE	On successful completion of the course, the students will: 1. Be able to identify concepts and issues in the scheduling of the systems, 2. Be able to use quantitative methods to model and solve scheduling problems, 3. Be able to formulate mathematical programming models for solving scheduling problems, 4. Have improved their practice on use of computer software packages (such as GAMS, CPLEX, LINGO, etc.)
TEXTBOOK	Pinedo, M., (2008), Scheduling: Theory, Algorithms and Systems, 3rd Edition, Prentice Hall.
OTHER REFERENCES	Brucker, P., (2004), Scheduling Algorithms, 4th Edition, Springer. French S., (1082), Sequencing and Scheduling, Wiley

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Introduction: Definition of the scheduling problem, notation, classification of scheduling problems
2	Equivalency of performance measures, complexity theory, classification of solution algorithms
3	Single machine scheduling problems: total flow time, weighted flow time, total lateness minimization
4	Single machine scheduling problems: Maximum lateness and maximum tardiness minimization, number of tardy jobs minimization, total weighted completion time with precedence constraints
5	Single machine scheduling problems: Neighborhood search techniques, branch and bound algorithm
6	Midterm Examination 1
7	Parallel machines scheduling problems: list scheduling, makespan with preemption, mean flow time
8	Flow shop scheduling problems: Permutation schedules, mathematical programming formulations
9	Flow shop scheduling problems: Heuristics for multiple machines makespan minimization, two-machine total flow time minimization
10	Job shop scheduling problems: Two-machine makespan minimization, Network representation of the job shop problem, priority dispatching rules, heuristic algorithms for makespan minimization
11	Midterm Examination 2
12	Open shop scheduling problems: Two-machine makespan, multiple machines makespan minimization
13	Metaheuristics: Simulated annealing, tabu-search and genetic algorithms
14	Project Presentation
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☐	☒	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☐	☒	☐
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☐	☐	☐
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☒	☐	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☒	☐	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☐	☒	☐
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☐	☐
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☐
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☐	☐
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☐	☐	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☐	☐	☐

Prepared by : Servet HASGÜL **Date:** 10.10.2015

Signature:

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Spring

COURSE			
CODE	503202509	TITLE	Materials Handling and Warehouse Systems

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3	0	0	3	7,5	COMPULSORY ( )	ELECTIVE (X)	Turkish

CREDIT DISTRIBUTION		
Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]

ASSESSMENT CRITERIA			
SEMESTER ACTIVITIES	Evaluation Type	Number	Contribution (%)
	Midterm	1	30
	Quiz		
	Homework		
	Project	1	30
	Report		
	Seminar		
	Other ( )		
		Final Examination	40

PREREQUISITE(S)	Facilities Planning, Simulation, and Engineering Economics courses should be taken
SHORT COURSE CONTENT	Materials handling equipments, handling systems, principles, analysis of, conveyors, AGV, AS/RS and carousel systems, warehouse models, warehouse design and management, manufacturing-stock relations, special topics in materials handling.
COURSE OBJECTIVES	Main aim of the course is to introduce the basic terminology and techniques of materials handling and warehouse systems and their influence to the production in terms of efficiency and efficacy. To relate the new developments, current techniques and operations research.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	
LEARNING OUTCOMES OF THE COURSE	1.Understand the materials handling systems that are crucial for manufacturing systems and current techniques and metodologies, 2.Apply operations research principles to solve and design materials handling systems 3.Assessing manufacturing systems in terms of efficiency and effectiveness by considering new handling equipments, 4. Analyzing costs related with new purchase of equipments, renwals, and maintenance costs.
TEXTBOOK	1.Askin R.G., Standrigge, 1993, Modelling and Analysis of Manufacturing Systems, John Wiley & Sons, Inc. 2.Garcia-Diaz A., Smith J.M., 2008, Facilities Planning and Design, Pearson Prince Hall.

	3.Stephens M.P., Meyers F.E., 2009, Manufacturing Facilities Design & Material Handling, 4th Ed. Pearson Education, Inc. 4.Tompkins J.A., White J.A., Bozer Y.A., Tanchoco J.M.A., 2010, Facilities Planning, John Wiley & Sons, Inc.
OTHER REFERENCES	Related journal papers, published case studies.

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Introduction to material handling systems, short history.
2	Aims of material handling, activities.
3	Principles of material handling.
4	Features of material handling equipments.
5	Dynamic programming, engineering economics and ergonomics applications in materials handling
6	Midterm Examination 1
7	Types and applications of conveyors
8	AGV system design and operationsl problems
9	AS/RS design and operational problems
10	Carusel systems and problems
11	Midterm Examination 2
12	Lifting equipments and problems
13	Definitions of warehouse systems and related problems
14	Project presentations
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☐	☐	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☐	☐	☐
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☐	☐	☐
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☒	☐	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☐	☐	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☐	☒	☐
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☐	☐
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☐
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☒	☐
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☐	☐	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☐	☐	☐

Prepared by : Associate Prof. Dr. Berna Ulutaş **Date:** 12/06/2015

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Fall

COURSE			
CODE	503202510	TITLE	SUPPLY CHAIN MANAGEMENT

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc				3	7.5	COMPULSORY ( )	ELECTIVE (X)	Turkish

CREDIT DISTRIBUTION		
Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
	1	2 √

ASSESSMENT CRITERIA			
	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	1	30
	Quiz		
	Homework		
	Project	1	30
	Report		
	Seminar		
	Other ( )		
	Final Examination		40

PREREQUISITE(S)	
SHORT COURSE CONTENT	Main concepts about supply chain management, analysis of supply chain, planning tasks along supply chain planning process, modules of current softwares related to supply chain, example applications.
COURSE OBJECTIVES	The main aim of the course is to give an opinion about planning and techniques in supply chain management.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	
LEARNING OUTCOMES OF THE COURSE	By the end of this module students will be able to: 1.Know main concepts about supply chain management. 2.Know the importance of integration, coordination, and collaboration 3.Know the importance of communication in the supply chain. 4.Know the key issues in supply chain management. 5.Know the key performance measurements. 6. Plan tasks along supply chain 7.Know the logistics network configuration. 8.Know the inventory management models. 9.Know methods for coping with the bullwhip effect. 10.Know distribution strategies. 11.Know starategic alliances such as 3PL,RSP. 12.Design a model of supplier selection
TEXTBOOK	Simchi-Levi, D., Kaminsky, P. and Simchi-Levi, E., (2003).Designing and Managing the Supply Chain: Concepts, Strategies, and Case Studies, McGraw-Hill /Irwin.U.S. ISBN: 0-07-119896-2.

OTHER REFERENCES	1. Ballou, R.H., (2004), Business Logistics/Supply Chain Management. Prentice Hall. New Jersey. ISBN: 0-13-066184-8. 2. Hartmut Stadtler and Christoph Kilger (eds), (2000). Supply Chain Management and Advanced Planning: Concepts, models, software and case studies, Springer, New York. ISBN: 3-540-67682. 3. Gianpaolo G.,Laporte G. and Musmanno R., (2003), John Wiley &Sons. UK. ISBN: 0-470-84917-7. 4. Harrison, T.P., Lee, H.L., Neale, J.J.(eds), (2005).The Practice of Supply Chain Management Where Theory and Application Converge. ISBN 0-387-24099-3.

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Main concepts about logistics, supply chain management. Conflicting goals
2	The importance of integration, coordination ond cooperation. Key performance factors
3	Planning tasks along supply chain
4	The importance of supply chain management. Examples from big firms
5	Logistics network configuration, basic models. Location selection problem.
6	Midterm Examination 1
7	Logistics network configuration, basic models. Warehouse location selection
8	Inventory management, methods for coping with the bullwhip effect
9	Distribution strategies. Cross-docking
10	Strategic alliances. Outsourcing, Third Party Logistics, 4PL.
11	Midterm Examination 2
12	Strategic alliances. Retailer-Supplier partnership (RSP)
13	Examples: Project presentations
14	Examples: Project presentations
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☒	☐	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☒	☐	☐
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☐	☒	☐
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☒	☐	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☒	☐	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☐	☒	☐
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☒	☐
LO 8	Ability to use a language for verbal and written communication.	☐	☒	☐
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☒	☐
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☐	☒	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☐	☒	☐

Prepared by : Doç.Dr. İnci SARIÇİÇEK **Date:** 12.06.2015

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (PhD)	SEMESTER	Spring

COURSE			
CODE	503212601	TITLE	Integer Programming

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
PhD	3	0	0			COMPULSORY ( )	ELECTIVE (X)	Turkish

CREDIT DISTRIBUTION		
Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]

ASSESSMENT CRITERIA			
	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	1	30
	Quiz		
	Homework	1	20
	Project	1	20
	Report		
	Other ( )		
		Final Examination	30

PREREQUISITE(S)	-
SHORT COURSE CONTENT	Basic concepts of integer programming, using 0-1 integer variables in modelling, examples of integer decision models. Enumeration, rounding and dynamic programming tehniques. Branch and bound and branch and cut algorithms. Additive algorithm for 0-1 integer models. Cutting plane algorithm. Column generation algorithm. Tabu search and simulated annealing algorithms.
COURSE OBJECTIVES	Basic aim of tihs course is to teach constuct integer models and use different solution techniques.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	To teach basic concepts of integer programming To understand special case of using 0-1 ineteger variables To develop modelling ability by teaching different integer models. To use different solution techniques for ineteger models.
LEARNING OUTCOMES OF THE COURSE	Comprehending integer models To learn solution techniques for integer models and tu use them together by synthesising. To understand difference between exact and heuristic solution To analyze obtained solution results.
TEXTBOOK	L. Rardin R.L., 1998, Optimization in Operations Research, Prentice Hall, 919 p.
OTHER REFERENCES	Der-San Chen, Robert G. Batson, Yu dang, 2010, Applied Integer Programming,Wiley, 490 p.

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Basic concepts of integer programming
2	Using 0-1 integer variables and ensuring special conditions
3	Models of knapsack, transportation, assignment, matching and bottleneck type problems.
4	Models of network and routing problems
5	Models of set covering, p-median, p-center, facility layout and scheduling problems
6	Midterm Examination 1
7	Complexity, concets of P, NP, NP-hard and total unimodularity
8	Enumeration, rounding and dynamic programming techniques
9	Branch and bound algorithm
10	Additivie algorithm, cutting plane algorithm and some special heuristic algorithms
11	Midterm Examination 2
12	Column generation and solution of cutting problems
13	Tightening of a model and branch and cut algorithm
14	Tabu search and simulated annealing algorithm
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES		**CONTRIBUTION LEVEL**		
NO	**LEARNING OUTCOMES (PhD)**	**3** High	**2** Mid	**1** Low
LO 1	Ability to understand and implement mathematics, basic and engineering sciences at utmost level in the field of Industrial Engineering and other relevant fields.	☒	☐	☐
LO 2	Ability to reach the newest knowledge, design, plan, manage, finalize and implement original research processes bringing innovation to science or technology in the field of Industrial Engineering and other relevant fields.	☐	☒	☐
LO 3	Ability to design, plan, manage, finalize and implement multidisciplinary innovative studies	☐	☐	☒
LO 4	Ability to present and publish the results of academic studies at all kind of platforms.	☐	☐	☒
LO 5	Ability to use at least one language sufficiently, skills for written, verbal, visual communication and discussion in that language.	☐	☐	☒
LO 6	Ability to make evaluation, critical analysis and synthesis about conceptions that are generated in the relevant field.	☐	☐	☒
LO 7	Ability to evaluate actual scientific, technological, social, cultural and environmental developments besides awareness of scientific neutrality, ethics and responsibility.	☐	☐	☒

Prepared by : Assoc. Prof. Dr. Aydın Sipahioğlu **Date:** 18.06.2015

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Spring

COURSE			
CODE	503212603	TITLE	Multiobjective Programming

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3	0	0	3	7,5	COMPULSORY ( )	ELECTIVE (x)	Turkish

CREDIT DISTRIBUTION

Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
	x	

ASSESSMENT CRITERIA

	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	1	20
	Quiz		
	Homework	1	10
	Project	1	40
	Report		
	Seminar		
	Other ( )		
	Final Examination		30

PREREQUISITE(S)	
SHORT COURSE CONTENT	Multiobjective programming examples, Decision and Objective Space, Order Cones, Efficient and nondominated solutions. Scalarization Methods, Nonscalarizing Methods. Solving multiobjective programming models by using software such as Lingo or Gams and interpretation of solution reports.
COURSE OBJECTIVES	The main aim of this course is to give information about fundamentals of multiobjective programming and solution techniques of multiobjective programming.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	By the end of this module students will be able to modeling and solving of multiobjective programming problems by using LINGO or GAMS. They will also be able to interpret the solution reports.
LEARNING OUTCOMES OF THE COURSE	Notification about the modelling and solving of multiobjective decision problems, application of modellling and solving of real life problems, comments of solution reports obtained by GAMS or LINGO, anayzing of different solution methods.
TEXTBOOK	Matthias Ehrgott, Multicriteria Optimization, Second Edition, Springer, 2005.
OTHER REFERENCES	Vira Chankong and Yacov Y.Haimes, Multiobjective Decision Making: Theory and Methodology, Elsevier Publishing, 1983.

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	What is multiobjective programming? Basic Concepts
2	Goal Programming
3	Decision and Objective Space, Order Cones, Classification of multiobjective optimization problems, Efficient and nondominated solutions.
4	Scalarization Methods, The Weited Sum Method, The e-Constraint Method
5	The Hybrid Method, The Elastic Constraint Method
6	Midterm Examination 1
7	Benson's Method, Compromise Solutions
8	Conic Method, comparison of the Scalarization Methods
9	Nonscalarizing Methods
10	Multiobjective Linear Programming
11	Midterm Examination 2
12	Multiobjective Simplex Method
13	Multiobjective Combinatorial Optimization
14	Multiobjective Versions of Some Polynomially Solvable Problems and Some NP-hard Problems
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		**CONTRIBUTION LEVEL**		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☐	☐	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☐	☐	☒
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☐	☐	☐
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☐	☐	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☒	☐	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☐	☐	☐
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☐	☐
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☐
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☐	☐
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☐	☐	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☐	☐	☐

Prepared by : Assit.Prof.Dr.Tuğba Saraç **Date:** 12.10.2015

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (PhD)	SEMESTER	Spring

COURSE			
CODE	503212605	TITLE	Taguchi Methods

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
PhD	3	0	0	3	7,5	COMPULSORY ( )	ELECTIVE (x)	Turkish

CREDIT DISTRIBUTION		
Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
x	x	x

ASSESSMENT CRITERIA			
	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	1	30
	Quiz		
	Homework		
	Project	1	30
	Report		
	Other ( )		
	Final Examination		40

PREREQUISITE(S)	-
SHORT COURSE CONTENT	INTRODUCTION TO DESIGN OF EXPERIMENTS, TAGUCHI PHILOSOPHY, TAGUCHI LOSS FUNCTION AND APPLICATIONS, TAGUCHI APPROACH, ORTHOGONAL ARRAYS, LINEAR GRAPHS, SIGNAL TO NOISE RATIO, INNER-OUTER ARRAYS, ROBUST DESIGN, COMPUTER APPLICATIONS.
COURSE OBJECTIVES	PLANNIG PROPER EXPERIMENTS, CONDUCTING THE EXPERIMENTS, STATISTICALLY ANALYZING THE EXPERIMENTS, AND EVALUATING THE RESULTS.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	LEARNING HOW TO PLAN AN EXPERIMENT, ANALYZE THE RESULTS REGARDING WITH THE ENGINEERING PROBLEMS
LEARNING OUTCOMES OF THE COURSE	1. ABLE TO DESIGN AND CONDUCT EXPERIMENTS 2. ABLE TO ANALYZE AND INTERPRET THE DATA 3. ABLE TO INDENTIFY, FORMULATE AND SOLVE ENGINEERING PROBLEMS 4. ABLE TO USE TECHNIQUES, SKILLS, AND MODERN ENGINEERING TOOLS SUCH AS COMPUTERS AND SOFTWARES NECESSARY FOR ENGINEERING PRACTICE
TEXTBOOK	Ross, P.J, Taguchi Techniques for Quality Engineering, McGraw-Hill, 1996.
OTHER REFERENCES	•Phadke, M.S., Quality Engineering Using Robust Design, Prentice Hall, 1989. •Fowlkes, W.Y., Creveling, C.M., Engineering Methods for Robust Product Design, Addison-Wesley, 1995. • Lochner, R.H., Matar, J.E., Designing for Quality, ASQC Quality

	Press, 1990.

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Introduction to Design of Experiments
2	Problem solving tools
3	Taguchi Philosophy
4	Taguchi Loss Functiobs and Applications
5	Taguchi Approach in Design of Experiments
6	Midterm Examination 1
7	Steps of Taguchi Approach
8	Orthogonal Arrays
9	Linear Graphs and Triangular Tables
10	Signal-Noise Ratios
11	Midterm Examination 2
12	Computer Applications
13	Robust Design
14	Project Presentations
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (PhD)**	**3** High	**2** Mid	**1** Low
LO 1	Ability to understand and implement mathematics, basic and engineering sciences at utmost level in the field of Industrial Engineering and other relevant fields.	☐	☒	☐
LO 2	Ability to reach the newest knowledge, design, plan, manage, finalize and implement original research processes bringing innovation to science or technology in the field of Industrial Engineering and other relevant fields.	☒	☐	☐
LO 3	Ability to design, plan, manage, finalize and implement multidisciplinary innovative studies	☐	☒	☐
LO 4	Ability to present and publish the results of academic studies at all kind of platforms.	☐	☐	☐
LO 5	Ability to use at least one language sufficiently, skills for written, verbal, visual communication and discussion in that language.	☐	☐	☐
LO 6	Ability to make evaluation, critical analysis and synthesis about conceptions that are generated in the relevant field.	☐	☒	☐
LO 7	Ability to evaluate actual scientific, technological, social, cultural and environmental developments besides awareness of scientific neutrality, ethics and responsibility.	☐	☐	☐

Prepared by : Prof. Dr. A. Sermet ANAGÜN **Date:** 01/09/2015

Signature:

T.R.
ESKISEHIR OSMANGAZI UNIVERSITY
GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Fall

COURSE			
CODE	503201511	TITLE	INVENTORY CONTROL

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc				3	7.5	COMPULSORY ( )	ELECTIVE (X)	Turkish

CREDIT DISTRIBUTION		
Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
	1	2 √

ASSESSMENT CRITERIA			
	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	1	30
	Quiz		
	Homework		
	Project	1	30
	Report		
	Seminar		
	Other ( )		
	Final Examination		40

PREREQUISITE(S)	
SHORT COURSE CONTENT	Main concepts about inventory control,the material flow system, uncertainty in inventory system, inventory policies, analysis of inventory systems, determisitc and stochastic models, quantity discounts, periodic and continuous review models.
COURSE OBJECTIVES	The main aim of the course is to give an opinion about planning and inventory systems in inventory control
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	Planning and control activities in inventory management.
LEARNING OUTCOMES OF THE COURSE	By the end of this module students will be able to: 1.Know main concepts about material flow system. 2.Know the importance of inventory control 3.Know the inventory problems. 4.Know the key measures of effectiveness. 5.Know the deterministic single item models with static demand. 6.Planning orders. 7.Know the multiple items and constraints. 8.Know the appropriate purchasing situation in the case of quantity discounts. 9.Know periodic review models. 10.Know continuous review models. 11.Make product mix decisions. 12.Solve process selection problems.

TEXTBOOK	Johnson L.A. and Montgomery D.C., (1974).Operations Research in Production Planning Schedulin,g and Inventory Control, John Wiley and Sons, NewYork.
OTHER REFERENCES	1.Sven Axsäte, 2000, Inventory Control, Springer Science+Business Media, NewYork. 2. Greene J.H., 1974, Production Planning and Inventory Control Systems and Decisions, Richard D.Irwin Inc., USA.

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Main concepts about material flow system, decision problems.
2	The importance of inventories and their management. The importance of a good inventory control system
3	The inventory problems, key measures of effectiveness, inventory policies.
4	The deterministic single item models with static demand. Planning orders.
5	The multiple items and constraints.
6	Midterm Examination 1
7	The appropriate purchasing situation in the case of quantity discounts.
8	Periodic review models.
9	Continuous review models.
10	Product mix decisions.
11	Midterm Examination 2
12	Process selection problems.
13	Project presentations
14	Project presentations
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☒	☐	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☒	☐	☐
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☐	☒	☐
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☒	☐	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☒	☐	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☐	☒	☐
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☒	☐
LO 8	Ability to use a language for verbal and written communication.	☐	☒	☐
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☒	☐
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☐	☒	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☐	☒	☐

Prepared by : Doç.Dr. İnci SARIÇİÇEK **Date:** 26.08.2015

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (PhD)	SEMESTER	Spring

COURSE			
CODE	503212604	TITLE	Genetic Algorithms

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
PhD	3	0	0	3	4	COMPULSORY ( )	ELECTIVE (x)	Turkish

CREDIT DISTRIBUTION		
Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
	1	2 √

ASSESSMENT CRITERIA			
SEMESTER ACTIVITIES	Evaluation Type	Number	Contribution (%)
	Midterm	1	30
	Quiz		
	Homework	1	30
	Project		
	Report		
	Other ( )		
	Final Examination		40

PREREQUISITE(S)	
SHORT COURSE CONTENT	Introduction to genetic and evolutionary algorithms, genetic modeling, selection and reproduction operators, genetic and evolutionary operators, use of genetic algorithms in combinatorial optimization problem, Matlab in building and solving genetic algorithms, multiobjective genetic algorithms, genetic programming
COURSE OBJECTIVES	Stochastic search algorithms find approximate best solution in discrete and nonlinear and large-scale optimization problems which is beyond the capability of linear programming. Genetic and evolutionary algorithms are the foremost among the heuristics which dominated the last 20 years. This course aimes to enable students to develop and use these approaches.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	Industrial engineering is the engineering of discrete systems. Operations research course is highly limited to solve discrete optimization problem. Heuristics and stochastics methods are quick solutions for practice and general purpose problem solver to academic world. Students who have taken this course can deal with all problems which are suitable for genetic modelling.
LEARNING OUTCOMES OF THE COURSE	1. Define genetic algorithms 2. Explain the types of genetic representation and choosing in accordance with usage purpose 3. Transform genetic operators into solution according to the problem 4.Design customized genetic algorithm for problem 5.Apply genetic approaches to multiobjective problems 6.Have basic knowledge of genetic programming
TEXTBOOK	Genetik Algorithms and Engineering Optimization, Mitsuo Gen ve Runwei Cheng, John Wiley and Sons, 2000
OTHER REFERENCES	Evolutionary Optimization Algorithms, Dan Simon, John Wiley and Sons, Inc. 2013

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Introduction to Genetic and Evolutionary Algorithms
2	Classic Optimization Problems
3	Classic Genetic Algorithms
4	Mathematical Models of Genetic Algorithms
5	Evolutionary Programming
6	Midterm Examination 1
7	Evolutionary Strategies
8	Genetic Programming
9	Types of Evolutionary and Genetic Algorithms I
10	Types of Evolutionary and Genetic Algorithms II
11	Midterm Examination 2
12	Combinatorial Optimization
13	Restricted Optimization
14	Multiobjective Optimization
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (PhD)**	**3** High	**2** Mid	**1** Low
LO 1	Ability to understand and implement mathematics, basic and engineering sciences at utmost level in the field of Industrial Engineering and other relevant fields.	☒	☐	☐
LO 2	Ability to reach the newest knowledge, design, plan, manage, finalize and implement original research processes bringing innovation to science or technology in the field of Industrial Engineering and other relevant fields.	☒	☐	☐
LO 3	Ability to design, plan, manage, finalize and implement multidisciplinary innovative studies	☐	☐	☐
LO 4	Ability to present and publish the results of academic studies at all kind of platforms.	☐	☐	☐
LO 5	Ability to use at least one language sufficiently, skills for written, verbal, visual communication and discussion in that language.	☐	☐	☐
LO 6	Ability to make evaluation, critical analysis and synthesis about conceptions that are generated in the relevant field.	☐	☐	☐
LO 7	Ability to evaluate actual scientific, technological, social, cultural and environmental developments besides awareness of scientific neutrality, ethics and responsibility.	☐	☐	☐

Prepared by : Prof.Dr. Muzaffer KAPANOĞLU **Date:** 03.11.2015

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Fall

COURSE			
CODE	503201510	TITLE	Decision Support Systems and Expert Systems

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3			3	5	COMPULSORY ( )	ELECTIVE (x)	Turkish

CREDIT DISTRIBUTION

Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
	1	2

ASSESSMENT CRITERIA

	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	1	30
	Quiz		
	Homework	3	30
	Project		
	Report		
	Seminar		
	Other ( )		
	Final Examination		40

PREREQUISITE(S)	
SHORT COURSE CONTENT	Basic Concepts of Decision Support Systems, Business Intelligence, Data Warehouse, Data Mining,Data Visualization and Business Analytics, Business Performance Management, Knowledge Management, Artificial Intelligence and Expert Systems
COURSE OBJECTIVES	All the necessary concepts and up-to-date information for decision engineering has been the overall purpose in teaching this course. All approaches which contribute to business intelligence from classic decision support systems to expert systems is aimed to examine fully and associate with problems.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	Career development of industrial engineering seems to be in the direction of management support systems. Because of the fact that industrial engineering would turn into decision support system engineering in time, firstly focusing on the basic concepts of decision support systems and then students are furnished with skills to put new methods and technology to real life practices.
LEARNING OUTCOMES OF THE COURSE	1.Define decision support system and its components 2.Explain the importance of data warehouse 3.Compare methods of data mining 4.Establish the relationship between knowledge management and expert systems 5.Practice with business analytics and data visualization

TEXTBOOK	Decision Support and Business Intelligence Systems, E.Turban, J.E.Aronson, TP.Liang, R. Sharda.Pearson Prentice-Hall, 10th edition.
OTHER REFERENCES	Decision Support Systems in the 21st Century, G.M. Marakas, Prentice-Hall, 1999.

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Decision Support Systems and Business Intelligence
2	Decision-Making Systems, Modeling and Support
3	Decision Support Systems: Concepts, Methods, Technologies
4	Modeling and Analysis
5	Business Intelligence and Data Warehousing
6	Midterm Examination 1
7	Business Analytics
8	Data Visualization
9	Data Mining
10	Web Analytics
11	Midterm Examination 2
12	Business Performance Management
13	Knowledge Management
14	Expert Systems
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☐	☐	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☐	☐	☐
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☐	☐	☐
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☒	☐	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☒	☐	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☒	☐	☐
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☐	☐
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☐
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☐	☐
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☐	☐	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☐	☐	☐

Prepared by : Prof.Dr.Muzaffer Kapanoğlu **Date:** 03.11.2015

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (PhD)	SEMESTER	Fall

COURSE			
CODE	503201505	TITLE	STOCHASTIC PROCESSES

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
PhD	3	0	0	3	7,5	COMPULSORY (X)	ELECTIVE ( )	ENGLISH

CREDIT DISTRIBUTION

Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
1	0	2

ASSESSMENT CRITERIA

	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	2	40
	Quiz		
	Homework	4	20
	Project		
	Report		
	Other ( )		
	Final Examination		40

PREREQUISITE(S)	Knowledge of undergraduate probability is recommended
SHORT COURSE CONTENT	Review of probability concepts, use of z-transform and Laplace transforms in probability, branching processes, Markov chains in discrete time, finite and infinite state Markov chains, random walks, classification of states, limiting behavior, Poisson process, birth and death processes, Markov chains in continuous time: limiting behavior, renewal process.
COURSE OBJECTIVES	The main aim of the course is to give students a sound basis in probability, to develop their ability to model stochastic events in related fields such as operations reseach, mathematics, business, finance, biology, chemistry and provide students with tools necessary that analyze the long run behaviour of such models.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	1. Ability to model stochastic events 2. Learn and use conditional probabilities and conditional expectations 3. Use of z-transforms in probability 4. Use of Laplace transforms in probability 5. Classify the states of a Markov Chain 6. Understand and model Markov chains in discrete time 7. Understand and model Poisson processes 8. Understand and model Birth-death processes 9. Understand and model Markov chains in continuous time
LEARNING OUTCOMES OF THE COURSE	* Ability to use z-transforms and Laplace transforms in probability * Knowkedge and use of conditional probabilities and cond. expectations * Understand the Markov Processes, abilty to model and analyze such stochastic problems * Understand the Poisson Processes, abilty to model and analyze such stochastic problems

TEXTBOOK	Taylor & Karlin, (1998). An Introduction to Stochastic Modeling. Academic Press, Third Edition.
OTHER REFERENCES	Ross, S. M. (2007). Introduction to Probability Models, Ninth Edition, Academic Press. Ross, S. M. (1983). Stochastic Processes, New York, John Wiley & Sons. Çınlar, E. (1975). Introduction to Stochastic Processes, Englewood Cliffs, NJ: Prentice-Hall.

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Review of fundamental concepts in probability
2	Conditinal probability, conditional expectation and cond. variance
3	Two dimensional random variables and their properties
4	Random sums, Z- transforms
5	Intro. to Markov chains
6	Midterm Examination 1
7	Markov Chains (continued)
8	Markov Chains (continued)
9	Markov Chains (continued)
10	Laplace transforms, Exponential distribution and their properties
11	Midterm Examination 2
12	Poisson Process
13	Birth & death processes
14	Continuous time Markov Processes
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (PhD)**	**3** High	**2** Mid	**1** Low
LO 1	Ability to understand and implement mathematics, basic and engineering sciences at utmost level in the field of Industrial Engineering and other relevant fields.	☒	☐	☐
LO 2	Ability to reach the newest knowledge, design, plan, manage, finalize and implement original research processes bringing innovation to science or technology in the field of Industrial Engineering and other relevant fields.	☐	☒	☐
LO 3	Ability to design, plan, manage, finalize and implement multidisciplinary innovative studies	☐	☐	☒
LO 4	Ability to present and publish the results of academic studies at all kind of platforms.	☐	☐	☒
LO 5	Ability to use at least one language sufficiently, skills for written, verbal, visual communication and discussion in that language.	☐	☐	☒
LO 6	Ability to make evaluation, critical analysis and synthesis about conceptions that are generated in the relevant field.	☐	☐	☒
LO 7	Ability to evaluate actual scientific, technological, social, cultural and environmental developments besides awareness of scientific neutrality, ethics and responsibility.	☐	☐	☒

Prepared by : R. Aykut ARAPOĞLU **Date:** 17.09.2015

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (PhD)	SEMESTER	Fall

COURSE			
CODE	503211602	TITLE	Group Technology and Flexible Manufacturing Systems

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
PhD	3	0	0	3	7.5	COMPULSORY ( )	ELECTIVE (x)	Turkish

CREDIT DISTRIBUTION		
Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
	x	

ASSESSMENT CRITERIA			
	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	1	40
	Quiz		
	Homework	1	20
	Project		
	Report		
	Other ( )		
	Final Examination		40

PREREQUISITE(S)	None
SHORT COURSE CONTENT	Introduction and Basic Concepts; Group technology (GT) and cellular manufacturing (CM); Cell design; Flexible manufacturing systems (FMS) and their components;
COURSE OBJECTIVES	The main aim of the course is to introduce the fundamental concepts and techniques in GT/CM field, their influence on manufacturing systems, potential contributions on effectiveness and efficiency of such systems, proceedings and trends , theoretical infra structure of employed techniques, and their involvement with OR area; To gain the required knowledge and skill to write a paper in GT/CM context.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	By the end of this module students will be able to: 1.To apply OR concept and tools (especially AI and computer support) to GT/CM, 2.To weigh up the recent trends like novel cell types, from the standpoint of efficiency and effectiveness of manufacturing systems,
LEARNING OUTCOMES OF THE COURSE	1.To introduce rationale behind GT/CM, their background 2. To introduce appropriate approaches, techniques and method in these fields, 3. To practice the steps necessary to conduct a research study. 4.To practice the steps necessary to report a research study.
TEXTBOOK	Singh, N., Rajamani, D., 1996, Cellular Manufacturing Systems Design, Planning and Control, Chapman & Hall.
OTHER REFERENCES	Askin R. G., Standrige C. R., Modeling and Analysis of Manufacturing Systems, John Wiley and Sons Inc., 1993

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Introduction
2	Group technology: Definition,Benefits, Classifications and coding systems
3	Cellular manufacturing, Production flow analysis, Cell formation problem
4	Cell formation using part machine matrix
5	Similarity coefficient based methods for cell formation
6	Midterm Examination 1
7	Performance measures
8	Mathematical programming methods for cell formation
9	Layout planning in cellular manufacturing
10	The concept of flexibility and introduction to FMS
11	Midterm Examination 2
12	Basic decisions in FMS
13	FMS loading problem, scheduling and control
14	Term project presentations
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (PhD)**	**3** High	**2** Mid	**1** Low
LO 1	Ability to understand and implement mathematics, basic and engineering sciences at utmost level in the field of Industrial Engineering and other relevant fields.	☐	☐	☐
LO 2	Ability to reach the newest knowledge, design, plan, manage, finalize and implement original research processes bringing innovation to science or technology in the field of Industrial Engineering and other relevant fields.	☐	☒	☐
LO 3	Ability to design, plan, manage, finalize and implement multidisciplinary innovative studies	☐	☐	☐
LO 4	Ability to present and publish the results of academic studies at all kind of platforms.	☐	☐	☐
LO 5	Ability to use at least one language sufficiently, skills for written, verbal, visual communication and discussion in that language.	☐	☐	☐
LO 6	Ability to make evaluation, critical analysis and synthesis about conceptions that are generated in the relevant field.	☒	☐	☐
LO 7	Ability to evaluate actual scientific, technological, social, cultural and environmental developments besides awareness of scientific neutrality, ethics and responsibility.	☐	☐	☐

Prepared by : Assist. Prof. Dr. Feriştah ÖZÇELİK **Date:** 10.06.2015

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (PhD)	SEMESTER	Spring

COURSE			
CODE	503202602	TITLE	NETWORK FLOW THEORY

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
PhD	3	0	0	3	7,5	COMPULSORY ( )	ELECTIVE (X)	TURKISH

CREDIT DISTRIBUTION		
Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
	0	3

ASSESSMENT CRITERIA			
	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	1	20
	Quiz		
	Homework	4	20
	Project	1	20
	Report		
	Other ( )		
		Final Examination	40

PREREQUISITE(S)	Knowledge of Linear Programming is recommended
SHORT COURSE CONTENT	Network flow formulations for a variety of network flow problems, concepts of graph theory, complexity of algorithms, shortest path problems, maximum flow problems, minimum cost network flow problems and related algorithms, assignment, transportation and matching problems, minimum spanning tree algorithms, network simplex method.
COURSE OBJECTIVES	Develop the ability to formulate and model a variety of real life problems as a network flow problem. Understand the use of network flow algorithms to solve such problems.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	1. Ability to model network flow problems 2. Basic concepts of the graph theory 3. Knowledge of network flow algorithms 4. Ability to formulate and solve shortest path problems 5. Ability to formulate and solve maximum flow problems 6. Ability to formulate and solve min cost flow problems
LEARNING OUTCOMES OF THE COURSE	* Knowledge of network flow models * Ability to apply network flow algorithms * Knowledge of the class P and NP, NP-Completeness * Read, understand and present a research paper
TEXTBOOK	1. Ahuja, R. K., T. L. Magnanti, and J. B. Orlin, (1993). Network Flows, Prentice Hall.
OTHER REFERENCES	Cormen, Leiserson, Rivest, (1996). Introduction to Algorithms, McGraw-Hill. Bertsekas, D. (1998). Network Optimization - Continuous and Discrete

	Models, Athena Scientific. Taha H. (1997). Operations Reasearch -- An Introduction, sixth edition, Prentice Hall. Hochbaum, D. (2006). Lecture Notes on Network Flows and Graph Algorithms at http://www.ieor.berkeley.edu/~hochbaum/

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Graph theory notations and definitions
2	Graph representations, BFS / DFS Trees
3	Topological ordering, DAG, Dijkstra's algorithm
4	All-pairs shortest path problem (Floyd-Warshall Algorithm)
5	Max. Flow problems, Max flow-Min cut theorem, Augmenting paths, Ford-Fulkerson Algorithm
6	Midterm Examination 1
7	Complexity classes P and NP, NP-Completeness
8	Min cost flow problem
9	Min cost flow problem
10	Network simplex
11	Midterm Examination 2
12	Network simplex
13	Paper presentations
14	Paper presentations
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (PhD)**	**3** High	**2** Mid	**1** Low
LO 1	Ability to understand and implement mathematics, basic and engineering sciences at utmost level in the field of Industrial Engineering and other relevant fields.	☒	☐	☐
LO 2	Ability to reach the newest knowledge, design, plan, manage, finalize and implement original research processes bringing innovation to science or technology in the field of Industrial Engineering and other relevant fields.	☐	☒	☐
LO 3	Ability to design, plan, manage, finalize and implement multidisciplinary innovative studies	☐	☐	☒
LO 4	Ability to present and publish the results of academic studies at all kind of platforms.	☐	☐	☒
LO 5	Ability to use at least one language sufficiently, skills for written, verbal, visual communication and discussion in that language.	☐	☐	☒
LO 6	Ability to make evaluation, critical analysis and synthesis about conceptions that are generated in the relevant field.	☐	☐	☒
LO 7	Ability to evaluate actual scientific, technological, social, cultural and environmental developments besides awareness of scientific neutrality, ethics and responsibility.	☐	☐	☒

Prepared by : R. Aykut ARAPOĞLU **Date:** 17.09.2015

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (PhD)	SEMESTER	Fall

COURSE			
CODE	503201505	TITLE	STOCHASTIC PROCESSES

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory			COMPULSORY (X)	ELECTIVE ( )	
PhD	3	0	0	3	7,5			TURKISH

CREDIT DISTRIBUTION

Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
1	0	2

ASSESSMENT CRITERIA

	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	2	40
	Quiz		
	Homework	4	20
	Project		
	Report		
	Other ( )		
	Final Examination		40

PREREQUISITE(S)	Knowledge of undergraduate probability is recommended
SHORT COURSE CONTENT	Review of probability concepts, use of z-transform and Laplace transforms in probability, branching processes, Markov chains in discrete time, finite and infinite state Markov chains, random walks, classification of states, limiting behavior, Poisson process, birth and death processes, Markov chains in continuous time: limiting behavior, renewal process.
COURSE OBJECTIVES	The main aim of the course is to give students a sound basis in probability, to develop their ability to model stochastic events in related fields such as operations reseach, mathematics, business, finance, biology, chemistry and provide students with tools necessary that analyze the long run behaviour of such models.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	1. Ability to model stochastic events 2. Learn and use conditional probabilities and conditional expectations 3. Use of z-transforms in probability 4. Use of Laplace transforms in probability 5. Classify the states of a Markov Chain 6. Understand and model Markov chains in discrete time 7. Understand and model Poisson processes 8. Understand and model Birth-death processes 9. Understand and model Markov chains in continuous time
LEARNING OUTCOMES OF THE COURSE	* Ability to use z-transforms and Laplace transforms in probability * Knowkedge and use of conditional probabilities and cond. expectations * Understand the Markov Processes, abilty to model and analyze such stochastic problems * Understand the Poisson Processes, abilty to model and analyze such stochastic problems

TEXTBOOK	Taylor & Karlin, (1998). An Introduction to Stochastic Modeling. Academic Press, Third Edition.
OTHER REFERENCES	Ross, S. M. (2007). Introduction to Probability Models, Ninth Edition, Academic Press. Ross, S. M. (1983). Stochastic Processes, New York, John Wiley & Sons. Çınlar, E. (1975). Introduction to Stochastic Processes, Englewood Cliffs, NJ: Prentice-Hall.

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Review of fundamental concepts in probability
2	Conditinal probability, conditional expectation and cond. variance
3	Two dimensional random variables and their properties
4	Random sums, Z- transforms
5	Intro. to Markov chains
6	Midterm Examination 1
7	Markov Chains (continued)
8	Markov Chains (continued)
9	Markov Chains (continued)
10	Laplace transforms, Exponential distribution and their properties
11	Midterm Examination 2
12	Poisson Process
13	Birth & death processes
14	Continuous time Markov Processes
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (PhD)**	**3** High	**2** Mid	**1** Low
LO 1	Ability to understand and implement mathematics, basic and engineering sciences at utmost level in the field of Industrial Engineering and other relevant fields.	☒	☐	☐
LO 2	Ability to reach the newest knowledge, design, plan, manage, finalize and implement original research processes bringing innovation to science or technology in the field of Industrial Engineering and other relevant fields.	☐	☒	☐
LO 3	Ability to design, plan, manage, finalize and implement multidisciplinary innovative studies	☐	☐	☒
LO 4	Ability to present and publish the results of academic studies at all kind of platforms.	☐	☐	☒
LO 5	Ability to use at least one language sufficiently, skills for written, verbal, visual communication and discussion in that language.	☐	☐	☒
LO 6	Ability to make evaluation, critical analysis and synthesis about conceptions that are generated in the relevant field.	☐	☐	☒
LO 7	Ability to evaluate actual scientific, technological, social, cultural and environmental developments besides awareness of scientific neutrality, ethics and responsibility.	☐	☐	☒

Prepared by : R. Aykut ARAPOĞLU **Date:** 17.09.2015

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Fall

COURSE			
CODE		TITLE	Reliability Analysis

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3	-	-	3	7.5	COMPULSORY ( )	ELECTIVE (X)	Turkish

CREDIT DISTRIBUTION		
Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
X		

ASSESSMENT CRITERIA			
SEMESTER ACTIVITIES	Evaluation Type	Number	Contribution (%)
	Midterm	2	50
	Quiz		
	Homework	1	15
	Project		
	Report		
	Seminar		
	Other ( )		
	Final Examination		35

PREREQUISITE(S)	
SHORT COURSE CONTENT	Rewiev of basics of probability and statsitics; Reliability and system safety measures. Life distributions and their applications in reliability. System reliability models. Design by reliability and probabilistic design. Reliability estimation and measurement by testing for binomial, exponential, and Weibull distributions; rewiev of reliability software..
COURSE OBJECTIVES	To understand the theory and practice system reliability concepts and statistical methods in the area.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	To develop and promote research interest in applying system reliability concepts.
LEARNING OUTCOMES OF THE COURSE	1. Application of basic probability and statistical methods; 2.To define and develop measures for reliability and safety 3. To model reliability by various life distributions 4. To be able to compute system reliability 5. To understand design and management of reliability programs
TEXTBOOK	E. E. Lewis, Introduction to Reliability Engineering, John Wiley & Sons, 1994.
OTHER REFERENCES	M. Bayazıt: Mühendislikte Güvenilirlik ve Risk Analizi; Birsen Yayınevi, 2007

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Basic probability notions
2	Some important discrete and continuous distributions
3	Basic statistical notions and test of hypotheses
4	Reliability and rates of failure
5	Time-dependent failure rates
6	Midterm Examination 1
7	Types of redundancy
8	Maintained systems
9	Failure interactions
10	Reliability models
11	Midterm Examination 2
12	Markov analysis
13	Probabilistic Risk Assessment of Complex Systems
14	Probabilistic Risk Assessment of Complex Systems
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☐	☒	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☒	☐	☐
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☐	☐	☐
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☒	☐	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☐	☒	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☐	☐	☐
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☒	☐
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☐
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☐	☐
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☐	☐	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☐	☐	☐

Prepared by : Assoc. Prof. Dr. Hasan Kıvanç AKSOY **Date:** April 18, 2016

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Fall

COURSE			
CODE		TITLE	Statistics and Six Sigma Approach

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3	-	-	3	7.5	COMPULSORY ( )	ELECTIVE (X)	Turkish

CREDIT DISTRIBUTION		
Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
X		

ASSESSMENT CRITERIA			
SEMESTER ACTIVITIES	Evaluation Type	Number	Contribution (%)
	Midterm	2	50
	Quiz		
	Homework	1	15
	Project		
	Report		
	Seminar		
	Other ( )		
	Final Examination		35

PREREQUISITE(S)	
SHORT COURSE CONTENT	Evolution and structure of Six Sigma; Six Sigma and Quality improvement; Applications of Six Sigma; Probability and some important distributions; Olasılık ve önemli dağılımlar; Basics of statistics, Measurement system capability analysis; Descriptive statistics; Inferential statistics, Regression analysis; Analysis of variance; Acceptance sampling plans.
COURSE OBJECTIVES	Enhanced review of probability and statistics, understanding Six Sigma methodology, understanding the applications of probability and statistics in six sigma and acceptance sampling.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	To develop and promote application and research interests in manufacturing and service systems to improve the system's quality.
LEARNING OUTCOMES OF THE COURSE	1.Learning the usability of probability and statistical methods; 2. Learning basics of Six Sigma Methodology; 3. Understanding different applications of six sigma in various areas; 4. Understanding the importance of measurement system analysis; 5. Understanding the basics of acceptance sampling
TEXTBOOK	G. Robin HENDERSON (2011) : Six Sigma-Quality Improvement with Minitab; John Wiley & Sons, UK
OTHER REFERENCES	Theodore T. ALLEN (2006) Ijntroduction to Engineerin Statisitcs and Six Sigma; Springer-Verlag,UK Douglas C. MONGOMERY, George C. RUNGER (2007) Applied Statistics an Probability for Engineers; John Wiley & Sons, UK

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Evolution and definition of six sigma
2	Structure of six sigmas
3	Six sigma and quality improvement
4	Probability, and some important discrete and continuous distributions
5	Statistics and basics
6	Midterm Examination 1
7	Measurement system analysis
8	Descriptive statistics
9	Inferential statistics
10	Regression analysis
11	Midterm Examination 2
12	Analysis of variance
13	Analysis of variance
14	Acceptance sampling plans
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☐	☒	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☒	☐	☐
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☐	☐	☐
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☒	☐	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☐	☒	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☐	☐	☐
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☒	☐
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☐
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☐	☐
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☐	☐	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☐	☐	☐

Prepared by : Nimetullah BURNAK, Ph. D., Prof. **Date:** April 21, 2016

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Fall

COURSE			
CODE		TITLE	Applied Methods in Ergonomics

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3	0	0	3	7,5	COMPULSORY ( )	ELECTIVE (x)	Turkish

CREDIT DISTRIBUTION

Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
1	2	√

ASSESSMENT CRITERIA

	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	2	40
	Quiz		
	Homework		
	Project	1	25
	Report		
	Seminar		
	Other ( )		
	Final Examination		35

PREREQUISITE(S)	
SHORT COURSE CONTENT	Introducing the widely used ergonomics methods with the support of sample cases.
COURSE OBJECTIVES	Making the students gain abilities to locate ergonomic problems, analyze them, gather relevant data and find solutions out.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	The course aims to teach relevant ergonomic methods for generating projects and solving problems in such various areas as manufacturing, service industry and academy.
LEARNING OUTCOMES OF THE COURSE	Comrehendson, Implementation, Analysis, Evaluation
TEXTBOOK	Handbook of Human Factors and Ergonomics Methods
OTHER REFERENCES	Human Factors in Engineering and Design Sağlık Boyutuyla Ergonomi Hekim ve Mühendisler İçin

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Human Body and Musculoskeletal System
2	Widespread Occupational Diseases and Reasons
3	Lifting and Working Postures
4	RULA, REBA and QEC methods
5	NIOSH and PLIBEL Methods
6	Midterm Examination 1
7	Netherlands and Cornell Musculoskeletal Discomfort Questionnaires
8	OWAS method and Winowas
9	Discomforts in Repetitive Works and OCRA method
10	Office Ergonomics and ROSA method
11	Midterm Examination 2
12	Cognitive Load
13	Nervous System and Cognitive Load Signs
14	Behavioral and Subjective methods
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☐	☒	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☒	☐	☐
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☒	☐	☐
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☒	☐	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☐	☒	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☒	☐	☐
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☒	☐
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☒
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☒	☐	☐
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☒	☐	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☒	☐	☐

Prepared by : Asst. Prof. N. Fırat Özkan **Date:** 18/04/2016

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Fall

COURSE			
CODE		TITLE	SIMULATION MODELLING

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3	0	0	3	5	COMPULSORY ( )	ELECTIVE (X)	TURKISH

CREDIT DISTRIBUTION

Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
0	1	2

ASSESSMENT CRITERIA

	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	1	30
	Quiz		
	Homework		
	Project	1	30
	Report		
	Seminar		
	Other ( )		
	Final Examination		40

PREREQUISITE(S)	
SHORT COURSE CONTENT	The aplication of simulation to industrial systems is taught. Basic concepts, tools and algorithms of discrete-event simulation modeling/analysis. Use of a specific computer simulation language (ARENA). Analysis of simulation output.
COURSE OBJECTIVES	- To teach students the basic concepts and algorithms of discrete-event simulation modeling/analysis - To introduce them to a specific computer simulation language (Arena). - To enable them to apply their probability and statistics knowledge to simulation modeling, input and output data analysis.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	The application of computer simulation to industrial settings is taught. The application of simulation to facilities layout for manufacturing is emphasized.
LEARNING OUTCOMES OF THE COURSE	After successfully completing the course, students should be able to do the following: 1. Understand the definition of simulation and how to develop and analyze a simulation model. 2. Understand the fundamental logic, structure, components and management of simulation modeling. 3. Demonstrate knowledge of how to use Arena. 4. Build a simulation model with basic operations and inputs. 5. Perform statistical analysis of output from terminating simulation.
TEXTBOOK	Kelton, W. David, Sadowski, Randall P., and Swets, Nancy B. (2010). Simulation with Arena, Fifth Edition. McGraw-Hill Higher Education.

OTHER REFERENCES	Banks, Jerry and J.S. Carson, II., B.L. Nelson and D.M. Nicol, (2010). Discrete Event System Simulation, fifth edition, New Jersey, Prentice-Hall.

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Course Introduction and Overview of Simulation
2	Simulation and Modeling
3	Fundamental Simulation Concepts
4	A Guided Tour through Arena
5	Modeling Basic Operations and Inputs
6	Midterm Examination 1
7	Modeling Detailed Operations
8	Find and Fixing Errors and Input Analysis
9	Problem Solving Using ARENA
10	More Simulation Model
11	Midterm Examination 2
12	Conducting Simulation
13	Statistical Analysis of Output from Simulations
14	Project Presentation
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☐	☐	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☐	☐	☐
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☐	☐	☒
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☐	☒	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☒	☐	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☒	☐	☐
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☒	☐
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☐
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☐	☐
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☐	☐	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☐	☐	☐

Prepared by : Servet HASGÜL **Date:** 06.05.2016

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Spring

COURSE			
CODE		TITLE	Design Tools for Six Sigma

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3	-	-	3	7.5	COMPULSORY ( )	ELECTIVE (X)	Turkish

CREDIT DISTRIBUTION		
Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
	X	

ASSESSMENT CRITERIA			
SEMESTER ACTIVITIES	Evaluation Type	Number	Contribution (%)
	Midterm	1	30
	Quiz		
	Homework		
	Project		
	Report		
	Seminar		
	Other (presentation)	2	30
	Final Examination		40

PREREQUISITE(S)	
SHORT COURSE CONTENT	An overview of Six Sigma; Concurrent engineering and DFSS, DFSS Project Algorithm, Quality Function Deployment (QFD), Theory of Inventive Problem Solving (TRIZ), Design FMEA, Process FMEA, Axiomatic Design, Design for X (manufacturing and assembly, reliability, maintainability, serviceability, environmentality, Life-Cycle Cost)
COURSE OBJECTIVES	Learning design tools for six sigma, application of design tools by student projects and presantations
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	Being a good practitioner of design tools for concurrent engineering and six sigma in manufacturing and service firms.
LEARNING OUTCOMES OF THE COURSE	1. Recognition of six sigma and DFSS; 2. Learning DFSS Tools; 3. Application of DFSS Tools.
TEXTBOOK	Yang, K., El-Haik, B. (2009) Design for Six Sigma: A road Map for Product Development, 2. baskı, Mc Graw-Hill, USA.
OTHER REFERENCES	Creveling, C.M., Slutsky, J.L., Antis Jr., D., (2003) Design for Six Sigma In technology and Produst Development, Prentice Hall, USA. G. Robin HENDERSON (2011) : Six Sigma-Quality Improvement with Minitab; John Wiley & Sons, UK

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	An Overview of Six Sigma Approach
2	Design for Six Sigma (DFSS)
3	Concurrent Engineering and DFSS Project Algoritm
4	Quality Function Deployment (QFD)
5	Quality Function Deployment (QFD)
6	Midterm Examination 1
7	TRIZ/Axiomatic Design/Design for X/(seminar and presentations)
8	TRIZ/Axiomatic Design/Design for X/(seminar and presentations)
9	TRIZ/Axiomatic Design/Design for X/(seminar and presentations)
10	Design Failure Mode and Effect Analysis (DFMEA)
11	Midterm Examination 2
12	Process Failure Mode and Effect Analysis (PFMEA)
13	Final Project Presentations (QFD, DFMEA, PFMEA)
14	Final Project Presentations (QFD, DFMEA, PFMEA)
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☐	☒	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☒	☐	☐
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☐	☐	☐
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☒	☐	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☐	☐	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☐	☒	☐
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☒	☐
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☐
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☐	☐
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☐	☐	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☐	☐	☐

Prepared by : Ezgi A. Demirtaş, Ph. D., Assoc.Prof. **Date:** May 05, 2016

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Spring

COURSE			
CODE	0	TITLE	Experimental Planning

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3	-	-	3	7,5	COMPULSORY ( )	ELECTIVE (X)	Turkish

CREDIT DISTRIBUTION

Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
X	X	X

ASSESSMENT CRITERIA

	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	1	30
	Quiz		
	Homework	1	10
	Project	1	20
	Report		
	Seminar		
	Other ( )		
	Final Examination		40

PREREQUISITE(S)	
SHORT COURSE CONTENT	Introduction Analysis of Variance, One-Way ANOVA, Two-Way ANOVA, Models used in Two-Way ANOVA, Introduction to Experimental Planning, Concept of Experiment, Types of Experiments, Determining the number of Exp., Full Factorial Experiments, Fractional Factorial Experiments, Steps of Experimental Planning, Yates Algorithm, Analyzing Experiments using Computer
COURSE OBJECTIVES	PLANNIG PROPER EXPERIMENTS, CONDUCTING THE EXPERIMENTS, STATISTICALLY ANALYZING THE EXPERIMENTS, AND EVALUATING THE RESULTS.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	EARNING HOW TO PLAN AN EXPERIMENT, ANALYZE THE RESULTS REGARDING WITH THE ENGINEERING PROBLEMS
LEARNING OUTCOMES OF THE COURSE	1. ABLE TO DESIGN AND CONDUCT EXPERIMENTS 2. ABLE TO ANALYZE AND INTERPRET THE DATA 3. ABLE TO INDENTIFY, FORMULATE AND SOLVE ENGINEERING PROBLEMS 4. ABLE TO USE TECHNIQUES, SKILLS, AND MODERN ENGINEERING TOOLS SUCH AS COMPUTERS AND SOFTWARES NECESSARY FOR ENGINEERING PRACTICE Please write minimum four learning outcomes for the course.
TEXTBOOK	Montgomery, D.C., Design and Analysis of Experiments, Wiley, 2009.
OTHER REFERENCES	Barrantine, L.B. (1999). An Introduction to Design of Experiments, ASQ Quality Press. Henderson, G.R. (2006). Six Sigma: Quality Improvement with MINITAB, Wiley.

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Introduction to Analysis of Variance
2	One-Way ANOVA
3	Two-Way ANOVA
4	Models used in Two-Way ANOVA
5	Introduction to Experimental Planning
6	Midterm Examination 1
7	Concept of Experiments and Strategies
8	Full Factorial Experiments
9	Fractional Factorial Experiments
10	Types of Experiments and Determining the number of Experiments
11	Midterm Examination 2
12	Steps of Experimental Planning and Computer Based Applications
13	Computer Based Applications
14	Project Presentations
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☐	☒	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☐	☐	☐
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☐	☐	☐
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☐	☐	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☒	☐	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☐	☐	☐
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☐	☒
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☐
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☐	☐
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☐	☐	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☐	☐	☐

Prepared by : Prof. Dr. A. Sermet Anagün **Date:** 22/04/2016

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Spring

COURSE			
CODE	5032xxxxx	TITLE	Personnel Evaluation

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3	0	0	3	7,5	COMPULSORY ( )	ELECTIVE (x)	Turkish

CREDIT DISTRIBUTION		
Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
1	2	

ASSESSMENT CRITERIA			
SEMESTER ACTIVITIES	Evaluation Type	Number	Contribution (%)
	Midterm	1	30
	Quiz		
	Homework		
	Project	1	20
	Report		
	Seminar		
	Other ( )		
	Final Examination		50

PREREQUISITE(S)	
SHORT COURSE CONTENT	Human resource management, definition, importance, factors forcing change in HRM, Job Analysis, job evaluation system process and methods, blue and white-collar job evaluation system, charge management, performance evaluation process and methods, personnel evaluation system design
COURSE OBJECTIVES	Explain the importance of Human Resource Management, labor motivation, give the ability to set up job evaluation and performance appraisal systems
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	Gain the skills of how to set up valuation systems to in order to provide motivation and productivity of the labor skills
LEARNING OUTCOMES OF THE COURSE	1. Ability to set up a business and / or performance appraisal system 2. Gain ethics of the protection of human rights with business and performance appraisal system
TEXTBOOK	Kahya, E., Personel (İş ve Performans) Değerlemesi, ESOGÜ Endüstri Mühendisliği Bölümü, 2016, Eskişehir.
OTHER REFERENCES	1. Sabuncuoğlu, Z., İnsan Kaynakları Yönetimi, Ezgi Kitabevi, 2000, Bursa. 2. Acar, N., İnsan Kaynakları Yönetimi, MPM Yayın No: 640, 2000, Ankara.

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Human Resources Management (HRM)
2	Job analysis
3	Job evaluation
4	Point method
5	Blue-collar job evaluation system
6	Midterm Examination 1
7	White-collar job evaluation system
8	Salary management
9	Blue-collar salary system
10	Performance appraisal
11	Midterm Examination 2
12	Evaluation methods
13	Applicaions from some sectors
14	Personnel evaluation system
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☐	☐	☒
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☐	☐	☒
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☐	☐	☒
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☐	☐	☒
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☐	☒	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☐	☒	☐
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☒	☐
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☒
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☐	☒
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☐	☒	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☒	☐	☐

Prepared by : Proff. Emin KAHYA **Date:** 18.04.2016

Signature:

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ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Spring

COURSE			
CODE	5032xxxxx	TITLE	Investment Projects Evaluation

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3	0	0	3	7,5	COMPULSORY ( )	ELECTIVE (x)	Turkish

CREDIT DISTRIBUTION

Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
1	2	

ASSESSMENT CRITERIA

	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	1	30
	Quiz		
	Homework		
	Project	1	20
	Report		
	Seminar		
	Other ( )		
		Final Examination	50

PREREQUISITE(S)	
SHORT COURSE CONTENT	Investment projects preparation, market analysis, technical analysis, financial analysis,
COURSE OBJECTIVES	Design of a product of production or service system, getting ability to implement stages of market analysis, technical analysis, financial analysis
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	To study how to prepare feasibility study of an investment
LEARNING OUTCOMES OF THE COURSE	1. ability to design a new investment with all stages 2. to be able to use the knowledge about courses like Engineering Economics, Facilities Planning, Work Study 3. ability to prepare a feasibility study of a business 4. ability to communicate with people who have different disciplines in a project preparing time
TEXTBOOK	Kahya, E., Girişimcilik ve Yatırım Projeleri Analizi, ESOGÜ Endüstri Mühendisliği Bölümü, 2016, Eskişehir.
OTHER REFERENCES	Sarıaslan, H., 2014, Yatırım Projelerinin Hazırlanması ve Değerlendirilmesi, 7.Baskı, Siyasal Kitabevi, Ankara.

	Şahin, H., 2009, Yatırım Projeleri Analizi, 4.Baskı, Ezgi Kitabevi, Bursa. Güvemli, O., 2001, Yatırım Projelerinin Düzenlenmesi, Değerlendirilmesi ve İzlenmesi, Yedinci Baskı, Atlas Yayın Dağıtım Ltd. Şti., İstanbul.

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Preparing of investment projects
2	Market analysis
3	Market analysis
4	Technical analysis
5	Technical analysis
6	Midterm Examination 1
7	Financial analysis
8	Financial analysis
9	Evaluation of investment projects
10	The effect of depreciation and income tax on investments
11	Midterm Examination 2
12	Investment analysis on risk
13	Preparing of job plan
14	Support programs.
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☐	☒	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☐	☒	☐
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☐	☐	☒
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☐	☒	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☒	☐	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☐	☒	☐
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☒	☐
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☒
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☐	☒
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☒	☐	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☒	☐	☐

Prepared by : Proff. Emin KAHYA **Date:** 18.04.2016

Signature:

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ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	Joint Course for the Institute	SEMESTER	Fall-Spring

COURSE			
CODE		TITLE	The Scientific Research Methods and Its Ethics

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc-Ph.D	3	0	0	3+0	7,5	COMPULSORY (X)	ELECTIVE ( )	Turkish

CREDIT DISTRIBUTION		
Basic Science	**Basic Engineering**	**Knowledge in the discipline [if it contains considerable design content, mark with (√)]**
1,5	1,5	

ASSESSMENT CRITERIA			
SEMESTER ACTIVITIES	**Evaluation Type**	**Number**	**Contribution (%)**
	Midterm	1	40
	Quiz		
	Homework		
	Project		
	Report		
	Seminar		
	Other ( )		
	Final Examination		60
PREREQUISITE(S)	None		
SHORT COURSE CONTENT	Science, the scientific thought and other fundamental concepts, the scientific research process and its techniques, Methodology: Data Collecting-Analysis-Interpretation, Reporting the scientific research (Preparation of a thesis, oral presentation, article, project), Ethics, Ethics of scientific research and publication.		
COURSE OBJECTIVES	The main objectives are: To examine the foundations of scientific research and the scientific research methods, to teach the principles of both the methodology and the ethics, to realize the process on a scientific research and to evaluate the results of research, to teach reporting the results of research (on a thesis, presentation, article).		
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	Applying the scientific research methods and the ethical rules in their professional life.		
LEARNING OUTCOMES OF THE COURSE	Gaining awareness on ethical principles at basic research methods, becoming skillful at analyzing and reporting the data obtained in scientific researches, being able to have researcher qualification with occupational sense of responsibility, having the scientific and vocational ethics' understanding and being able to defend this understanding in every medium.		
TEXTBOOK (Turkish)	Karasar, N. (2015). Bilimsel Araştırma Yöntemi. Nobel Akademi Yayıncılık, Ankara.		
OTHER REFERENCES	**1-**Büyüköztürk, Ş., Çakmak, E. K., Akgün, Ö. E., Karadeniz, Ş., Demirel, F. (2012). Bilimsel Araştırma Yöntemleri. Pegem Akademi Yayınevi, Ankara. **2-**Tanrıöğen, A. (Editör). (2014). Bilimsel Araştırma Yöntemleri. Anı		

	Yayıncılık, Ankara. **3-**Türkiye Bilimler Akademisi Bilim Etiği Komitesi. Bilimsel Araştırmada Etik ve Sorunları, Ankara: TÜBA Yayınları, (2002). **4-**Ekiz, D. (2009). Bilimsel Araştırma Yöntemleri: Yaklaşım, Yöntem ve Teknikler. Anı Yayıncılık, Ankara. **5-**Day, Robert A. (Çeviri: G. Aşkay Altay). (1996). Bilimsel Makale Nasıl Yazılır ve Nasıl Yayımlanır?, TÜBİTAK Yayınları, Ankara. **6-**Özdamar, K. (2003). Modern Bilimsel Araştırma Yöntemleri. Kaan Kitabevi, Eskişehir. **7-**Cebeci, S. (1997). Bilimsel Araştırma ve Yazma Teknikleri. Alfa Basım Yayım Dağıtım, İstanbul. **8-**Wilson, E. B. (1990). An Introduction to Scientific Research. Dover Pub. Inc., New York. **9-**Çömlekçi, N. (2001). Bilimsel Araştırma Yöntemi ve İstatistiksel Anlamlılık Sınamaları. Bilim Teknik Kitabevi, Eskişehir.

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Science, scientific thought and other basic concepts (University, history of university, higher education, science, scientific thought and other related concepts)
2	Science, scientific thought and other basic concepts (University, history of university, higher education, science, scientific thought and other related concepts)
3	The scientific research and its types (Importance of the scientific research, types of science, scientific approach)
4	The scientific research process and its techniques (Access to the scientific knowledge, literature search, determining the research issue, definition of the problem, planning)
5	The scientific research process and its techniques (Access to the scientific knowledge, literature search, determining the research issue, definition of the problem, planning)
6	The scientific research process and its techniques (Access to the scientific knowledge, literature search, determining the research issue, definition of the problem, planning)
7	The method and the approach: Collecting, analysis and interpretation of the data (Data, data types, measurement and measurement tools, collecting data, organizing data, summarizing data, analysis and the interpretation of data)
8	The method and the approach: Collecting, analysis and interpretation of the data (Data, data types, measurement and measurement tools, collecting data, organizing data, summarizing data, analysis and the interpretation of data)
9	Finalizing the scientific research (Reporting, preparing the thesis, oral presentation, preparing an article and a project)
10	Finalizing the scientific research (Reporting, preparing the thesis, oral presentation, preparing an article and a project)
11	Finalizing the scientific research (Reporting, preparing the thesis, oral presentation, preparing an article and a project)
12	Ethics, scientific research and publication ethics (Ethics, rules of ethics, occupational ethics, non-ethical behaviors)
13	Ethics, scientific research and publication ethics (Ethics, rules of ethics, occupational ethics, non-ethical behaviors)
14	Ethics, scientific research and publication ethics (Ethics, rules of ethics, occupational ethics, non-ethical behaviors)
15,16	Mid-term exam, Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INSTITUTE'S GRADUATE PROGRAMME'S LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (M.Sc.-Ph.D.)**	**3** High	**2** Mid	**1** Low
LO 1	Having the scientific and vocational ethics' understanding and being able to defend this understanding in every medium.	☒	☐	☐
LO 2	Being able to have researcher qualification with occupational sense of responsibility.	☒	☐	☐
LO 3	Becoming skillful at analyzing and reporting the data obtained in scientific researches.	☒	☐	☐
LO 4	Gaining awareness on ethical principles at basic research methods.	☒	☐	☐

Prepared by : Prof.Dr.Hürriyet Erşahan, Prof.Dr. Ece Turhan, Prof.Dr. Abdullah Alğın, Doç.Dr. Özlem Alpu, Doç.Dr. Fatih Çemrek

Date: 14.06.2016

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (PhD)	SEMESTER	Fall

COURSE			
CODE		TITLE	DECISION MAKING FOR DEFENSE AND SECURITY SYSTEMS

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
PhD	3	0		3		COMPULSORY ( )	ELECTIVE (X)	TURKISH

CREDIT DISTRIBUTION

Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
	X	

ASSESSMENT CRITERIA

	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	1	25
	Quiz		
	Homework	1	20
	Project	1	25
	Report		
	Other ( )		
		Final Examination	30

PREREQUISITE(S)	
SHORT COURSE CONTENT	Critical area defense and security systems especially in the military area are becoming more and more important nowadays. Operations Research tecniques, mathematical modelling together with its solvers and heuristic approaches play important roles on the solution of such problems. Usually there are two sides (attacker or defenser) on the problem but the models developed could be designed from the point of just one side or by considering both sides. How to assess the vulnerabilities of such operational systems when there are threats by using interdiction models and their solutions is the topic of this course. Destroying the electric power, water, communication, gas or computer system or destroying a bridge, hospital or even terrorist attacks are such threats. Locating sensors to monitor drinking water, electric power or gas lines or networks and to decide how to locate them, vulnerability analysis and attacker or defenser decisions are practical implications. Mathematical modelling, solvers and heuristic approaches, probability and risk analysis are mostly used techniques for solving such problems. On the other hand, effectiveness analysis is also required once the problem is solved and multicriteria decision making techniques, probability, risk assesments, design of experiment etc. are used for that phase.
COURSE OBJECTIVES	The students will be aware of the main threats that some operational systems or societies may have and their ability to cope with difficult decision making issues on these processes. The course will provide them the opportunity to define, analyze, solve the defined problems of such systems and they will discuss the efficiency of such solutions as post optimality analysis.

COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	Be able to analyse and solve the unstructured or semi structured problems are the main contribution of this course.
LEARNING OUTCOMES OF THE COURSE	Analyzing the complex decison problems, learning defense and security systems and their risks, having ability to solve the decision problems related to these issues and analyzing the outcomes.
TEXTBOOK	Naval Postgraduate School open sources Network Interdiction Models, Robert L. Steinrau M. Ehrgott, Multicriteria Optimization, Berlin - Heidelberg: Springer, 2005. Naval Engineers Journal (bazı sayılar ve makaleler)
OTHER REFERENCES	Office of Aerospace Studies, «AoA Handbook: A Guide for Performing an Analysis of Alternatives (AoA),» Air Force Materiel Command (AFMC) OAS/DR, 2000. Published articles related to the topic. GAMS, MATLAB, Excel VBA D. C. Montgomery, Design and Analysis of Experiments, John Wiley&Sons, 2009.

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Basic concepts (threat and attacks, defense, interdiction, vulnerability, risk, mathematial model)
2	Problem types: Destroying the electric power, water, communication, gas or computer system or destroying a bridge, hospital or terrorist attacks, syber threats.
3	Problem types: Discussion
4	Mathematical models for main problems defined in 2 and 3 and their soluions.
5	Mathematical models for main problems defined in 2 and and their solutions.
6	Midterm Examination 1
7	Paper discussions (articles from literature), real cases.
8	Paper discussions (articles from literature), real cases.
9	Risk assesment models
10	Military problems, war strategies
11	Midterm Examination 2
12	Mathematical model solutions, real cases, student projects
13	Efficiency analysis
14	Efficiency analysis
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (PhD)**	**3** High	**2** Mid	**1** Low
LO 1	Ability to understand and implement mathematics, basic and engineering sciences at utmost level in the field of Industrial Engineering and other relevant fields.	☒	☐	☐
LO 2	Ability to reach the newest knowledge, design, plan, manage, finalize and implement original research processes bringing innovation to science or technology in the field of Industrial Engineering and other relevant fields.	☒	☐	☐
LO 3	Ability to design, plan, manage, finalize and implement multidisciplinary innovative studies	☐	☒	☐
LO 4	Ability to present and publish the results of academic studies at all kind of platforms.	☐	☐	☒
LO 5	Ability to use at least one language sufficiently, skills for written, verbal, visual communication and discussion in that language.	☐	☐	☒
LO 6	Ability to make evaluation, critical analysis and synthesis about conceptions that are generated in the relevant field.	☐	☐	☒
LO 7	Ability to evaluate actual scientific, technological, social, cultural and environmental developments besides awareness of scientific neutrality, ethics and responsibility.	☐	☒	☐

Prepared by : **Date:**

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Fall

COURSE			
CODE		TITLE	PROBABILITY THEORY AND STATISTICS

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3	0	0	3	7,5	COMPULSORY ( )	ELECTIVE (X)	TURKISH

CREDIT DISTRIBUTION

Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
2	1	

ASSESSMENT CRITERIA

	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	1	30
	Quiz	1	10
	Homework	4	20
	Project		
	Report		
	Seminar		
	Other ( )		
	Final Examination		40

PREREQUISITE(S)	NONE
SHORT COURSE CONTENT	Discrete and continuous random variables, distribution functions, expectation, variance, covariance, jointly distributed random variables, conditional expectation and conditional distributions, probability and moment generation functions, sampling theory, parameter estimation, point and interval estimation, CLT
COURSE OBJECTIVES	1. To provide students with fundamental probability and statistics notions in the fields of IE/OR to allow them to follow more advanced courses such as stochastic processes. 2. To provide students with knowledge of mathematics required to solve advanced probability problems 3. To increase/enhance the interest and curiosity of students in the stochastic models.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	To provide students willing to study in the field of stochastic models with fundamentals of mathematics and probability.
LEARNING OUTCOMES OF THE COURSE	* To grasp well probability theoretic and statistical concepts. * To grasp the functionality of random variables and to apply in modeling * Grasp and be able to solve complex probability/statistics problems * To be able to analyze probability problems encountered in various fields.
TEXTBOOK	"A First Course in Probability", Sheldon Ross, 4. basım,1994.

OTHER REFERENCES	* "Olasılık Kuramında Çözümlü Problemler",T. Khaniyev, İ. Ünver, Z. Küçük, T. Kesemen, Nobel Yayınları, 2017. * "Basic Probability Theory", Robert B. Ash, Dover Publications, 2008.

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Sequences and series, convergence, mathematical induction
2	Fundamental probability concepts and Kolmogorov's axioms of probability
3	Discrete random variables
4	Continuous random variables
5	Expectation and variance - change of variable technique
6	Midterm Examination 1
7	Jointly distributed random variables, covariance, correlation coefficient
8	Conditional probability, conditional expectation, conditional variance
9	Probability and moment generating functions
10	Convolution method for random variables
11	Midterm Examination 2
12	Sampling theory, parameter estimation, point and interval estimations
13	Hypothesis tests
14	Central limit theorem and other limit theorems
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☒	☐	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☐	☒	☐
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☒	☐	☐
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☐	☒	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☒	☐	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☐	☐	☒
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☐	☒
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☒
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☐	☒
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☐	☐	☒
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☐	☐	☒

Prepared by : Dr. Öğr. Üyesi R. Aykut ARAPOĞLU **Date:** 16.04.2018

Signature:

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ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Fall

COURSE			
CODE		TITLE	Human Machine Interaction

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3	0	0	3	7,5	COMPULSORY ( )	ELECTIVE (x)	Turkish

CREDIT DISTRIBUTION		
Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
1	2	√

ASSESSMENT CRITERIA			
	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	2	40
	Quiz		
	Homework		
	Project	1	25
	Report		
	Seminar		
	Other ( )		
	Final Examination		35

PREREQUISITE(S)	
SHORT COURSE CONTENT	Introducing the widely used interface design and usability methods with the support of sample cases.
COURSE OBJECTIVES	Making the students gain abilities to solve problems related with human machine design, analyze them, gather relevant data and find solutions out.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	The course aims to teach relevant methods for generating projects and solving problems in such various areas as manufacturing, service industry and academy.
LEARNING OUTCOMES OF THE COURSE	Comrehendson, Implementation, Analysis, Evaluation
TEXTBOOK	Dix. A, Finlay J., Abowd G.D., Beale R., 2004, Human Computer Interaction, Pearson Education Ltd.
OTHER REFERENCES	Shneiderman B., C. Plaisant, et al., 2017, Designing the User Interface, Addison Wesley.

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Why design for usability, historical Perspective: machinery, computers
2	Human Perception, Information Presentation and Layout
3	Input Devices and Ergonomics, Virtual Reality
4	Low-Level Human Cognition, GOMS Keystroke-Level Modeling
5	Higher Cognition, Interaction Styles
6	Midterm Examination 1
7	Observing Users, Usability Studies
8	Error Handling, Error Prevention, Usability Analysis
9	Specifying and Prototyping
10	Task Analysis, User-Centered Design
11	Midterm Examination 2
12	Interface Implementation
13	IBM CUSQ anketi
14	Technology Acceptance Model (TAM)
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☐	☒	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☒	☐	☐
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☒	☐	☐
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☒	☐	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☐	☒	☐
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☒	☐	☐
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☐	☒	☐
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☒
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☒	☐	☐
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☒	☐	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☒	☐	☐

Prepared by : Asst. Prof. N. Fırat Özkan **Date:** 9/04/2018

Signature:

T.R.

ESKISEHIR OSMANGAZI UNIVERSITY

GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

COURSE INFORMATION FORM

DEPARTMENT	INDUSTRIAL ENGINEERING (MSc)	SEMESTER	Spring

COURSE			
CODE		TITLE	Product and Process Development

LEVEL	HOUR/WEEK			Credit	ECTS	TYPE		LANGUAGE
	Theory	Practice	Laboratory					
MSc	3	0	0	3	7.5	COMPULSORY ( )	ELECTIVE (x)	TURKISH

CREDIT DISTRIBUTION		
Basic Science	Basic Engineering	Knowledge in the discipline [if it contains considerable design content, mark with (√)]
	X	√

ASSESSMENT CRITERIA			
	Evaluation Type	Number	Contribution (%)
SEMESTER ACTIVITIES	Midterm	1	30
	Quiz		
	Homework		
	Project	1	35
	Report		
	Seminar		
	Other ( )		
		Final Examination	35

PREREQUISITE(S)	
SHORT COURSE CONTENT	The course will cover the process of new product development in established firms. The content will broadly cover the following topics: the role of new forms of product & service innovations in firms and their contribution to the firms competitive advantage; and the activities involved in the development of new product starting with opportunity development and concept generation up to product testing.
COURSE OBJECTIVES	The aims of this course are to examine the activities and competencies associated with the development of new products in firms, and to provide students with technical and practical knowledge and skills required to engage in new product development projects.
COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION	Ability to develop new products and systems
LEARNING OUTCOMES OF THE COURSE	1. Plan a product line for the specific target market your team is designing. 2. Conduct detailed research on target market with documentation and research tools. 3. Understand the life cycle of a production for the mass market. 4. Understand how product type, fabrication, and market level affect production techniques. 5. Construct team-designed garments while working in a team environment.
TEXTBOOK	Product Design and Development -6th edition- (Karl Ulrich & Steven Eppinger,
OTHER REFERENCES	

COURSE SCHEDULE (Weekly)	
WEEK	**TOPICS**
1	Charecteristics of Successful Product
2	Development Process and Organizations
3	Opportunity Identification
4	Product Planning
5	Identifying Customer Needs
6	Midterm Examination 1
7	Product Metrics
8	Concept Generation
9	Concept Selection
10	Concept Testing
11	Midterm Examination 2
12	Product Architecture
13	Industrial Design
14	Design for Manufacturing
15,16	Final Examination

CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INDUSTRIAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES		CONTRIBUTION LEVEL		
NO	**LEARNING OUTCOMES (MSc)**	**3** High	**2** Mid	**1** Low
LO 1	Accessing deep and advanced knowledge through scientific researches in the field of Industrial Engineering, ability to evaluate, interpret and implement the knowledge.	☐	☒	☐
LO 2	Having comprehensive knowledge about actual techniques and methods in engineering as well as their constraints.	☐	☒	☐
LO 3	Completion and implementation of uncertain, limited or missing data through scientific methods in addition ability to use knowledge belongs to various disciplines.	☐	☒	☐
LO 4	Awareness of new and developing Industrial Engineering practices, ability to investigate and learn them as needed.	☒	☐	☐
LO 5	Ability to define and formulate problems related to industrial engineering and skills for developing methods to solve the problems and using innovative methods during solutions.	☐	☐	☒
LO 6	Developing new and/or original methods and conceptions; ability to design systems or processes and ability to develop innovative solutions in designs.	☒	☐	☐
LO 7	Ability to work efficiently in disciplinary and multidisciplinary teams, skills for taking the lead in the teams and developing solution approaches under complicate conditions; ability to work independently and take responsibility.	☒	☐	☐
LO 8	Ability to use a language for verbal and written communication.	☐	☐	☒
LO 9	Ability to transmit results and processes of studies systematically and definitively to national/international, verbal/written platforms which are inside or outside the relevant field.	☐	☒	☐
LO 10	To be informed of social, environmental, health, security and law aspects of engineering practices besides project management and business life practices and awareness of constraints caused by them.	☒	☐	☐
LO 11	Awareness of considering social, scientific and ethical principles during data collection, interpretation, announcement stages besides all vocational activities.	☐	☒	☐

Prepared by : N.Fırat ÖZKAN **Date:** 12/11/2018

Signature: