İZMİR INSTITUTE OF TECHNOLOGY
GRADUATE SCHOOL OF ENGINEERING AND SCIENCES
DEPARTMENT OF ENGINEERING MANAGEMENT
CURRICULUM OF THE M.S. PROGRAM IN ENGINEERING MANAGEMENT
(NON-THESIS, SECOND EDUCATION)

Core Courses

		Credit	ECTS
EM 500	Graduation Project	(0-1)NC	17
EM 503	Organization Theory and Management	(3-0)3	7
EM 504	Project Management	(3-0)3	7
EM 505	Statistics for Engineers	(3-0)3	7
EM 506	Systems Engineering and Operations Research	(3-0)3	7
EM 507	Financial Analysis and Engineering Economics	(3-0)3	7
EM 508	Research Seminar and Ethical Issues	(0-1)NC	3

Elective Courses

		Credit	ECTS
EM 501	Research Methodologies	(3-0)3	7
EM 521	Production Management Systems	(3-0)3	7
EM 522	Supply Chain Management	(3-0)3	7
EM 523	Information Systems	(3-0)3	7
EM 524	Introduction to Knowledge Management	(3-0)3	7
EM 534	Multivariate Statistical Data Analysis	(3-0)3	7
EM 535	Statistical Quality Control	(3-0)3	7
EM 536	Design of Experiments and Process Optimization	(3-0)3	7
EM 541	Total Quality Management	(3-0)3	7
EM 542	Scheduling	(3-0)3	7
EM 544	Technology and Innovation Management	(3-0)3	7
EM 562	Strategic Management	(3-0)3	7
EM 564	Marketing Management	(3-0)3	7
EM 565	Principles Of Entrepreneurship	(3-0)3	7
EM 566	Managerial Economics	(3-0)3	7
EM 568	Business Ethics and Negotiation	(3-0)3	7
EM 569	Conflict Management	(3-0)3	7
EM 571	Organizational Behaviour	(3-0)3	7
EM 573	History of Administrative Philosophy	(3-0)3	7
EM 582	Soft Methods for Planing and Management	(3-0)3	7
EM 583	Quantitative Methods for Decision Making	(3-0)3	7
EM 590	Natural Resource Management	(3-0)3	7
EM 591	Carbon Management	(3-0)3	7
EM 593	Catalyst Development	(3-0)3	7
EM 594	Catalyst Process Engineering	(3-0)3	7
EM 595	Chemical Process Analysis and Simulation	(3-0)3	7
EM 596	Environmental Management	(3-0)3	7

Total credit (min.)   :30
Number of courses with credit (min.):10
There is NO prerequisite applied for any of our courses.
It isn't mandatory for students to take EM508 Research Seminar and Ethical Issues ve EM500 Graduation Project courses in the same semester.
It is mandatory for students to succeed in at least 4 credit courses in order to be able to take EM500 Graduation Project course.

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COURSE DESCRIPTIONS

		Credit	ECTS
EM 500	**Graduation Project**	**(0-1)NC**	**17**

Every student is expected to complete a graduation project to graduate with the consent of the adviser.

EM 501	**Research Methodologies**	**(3-0)3**	**7**

This course outlines the basic principles of research including: research design, sampling, data collection, data analysis, and report writing.The nature of research and research process are analyzed. Methodologies of research are disscussed and evaluated with in-class experimental studies

EM 503	**Organization Theory and Management**	**(3-0)3**	**7**

This course will provide student with the basis upon which he or she will be able to build some knowledge and understanding of organizations and their management. Throughout this course emphasis will be placed on understanding the importance of organizations in society, comparing and contrasting major organizational theories, analyzing the effect that the external and internal environments have on organizations and using fundamental concepts of organizational theory to diagnose and manage organizational phenomenon

EM 504	**Project Management**	**(3-0) 3**	**7**

Principles of project management and the development of contemporary management concepts. Definition, planning, implementation, and control of projects. Roles of designer, owner, general contractor and project manager. Negotiating, risk management, scheduling and cost control concepts. Total quality management perspectives. Systems theory as applied to the design and production processes. Alternates for structuring information flows and the control of projects.

EM 505	**Statistics for Engineers**	**(3-0) 3**	**7**

In this course, basics of descriptive and graphical statistics such as mean, variance, probability distributions, hypothesis testing, bar and pie charts, line and scatter graphs, histograms will be given to provide the students with the tools of simple data analysis and prepare them for advanced statistical techniques. Also covered is an introduction to linear regression and design of experiments.

EM 506	**Systems Engineering and Operations Research**	**(3-0) 3**	**7**

This course will mainly focus on the engineering of systems and on systems analysis. In the first place, emphasis is on the process of bringing systems into being, beginning with the definition of the need and extending through requirements analysis, functional analysis and allocation, design synthesis, design evolution, and system validation. Then, concern is with the improvement of systems already in existence.

The course will also cover most useful Operations Research (OR) mathematical models. The models to be studied include linear and nonlinear programming (optimization), queuing theory, decision theory, etc.

	Credit	ECTS

EM 507   Financial Analysis and Engineering Economics   (3-0) 3   7

The purpose of the course is to explain the principles and techniques needed for making decisions about acquisition and retirement of capital goods. The course covers basic concepts, principles and mathematics involved, ie., interest rate, compound interest, equivalence, present worth, continuous compounding, depreciation; and procedures and methods for evaluating alternatives ie., equivalent uniform cash flow method, present worth method, internal rate of return method, benefit-cost ratio method. Included also in the course are techniques for handling special situations such as studies for retirement and replacement, capital budgeting and minimum attractive rate of return, inflation and sensitivity analysis, using probabilities in economy studies.

EM 508   Research Seminar and Ethical Issues   (0-1)NC   3

Learn the latest updated subjects and problems on the management science during the conferences given by the invited speakers; prepare and present a talk about a subject investigated and studied at the end of the semester. Lectures on ethical issues in research are also included.

EM 521   Production Management Systems   (3-0) 3   7

The main objective of the course is to provide students with the essential concepts in developing computer integrated manufacturing systems including Material Requirements Planning (MRP), Manufacturing Resource Planning (MRPII), and Just-in-Time (JIT) with emphasis on inventory, work order management, shop floor control and group technology based parts classification and coding schemes. Optimized Production Technology (OPT) is also discussed in detail.

EM 522   Supply Chain Management   (3-0) 3   7

Recently, emphasis in competitive advantage has shifted from a firm focused perspective to supply chains. Supply chains contain not only the "firm" but also its customers, customers' customers, suppliers, suppliers' suppliers all the way from raw materials to the end customer. This course is designed to study the concepts in design and control of such supply chains. Inventory management is at the core of the course together with logistics network design, distribution strategies, and information sharing, coordination, and decision support tools. The course is supported with real life case studies to facilitate discussion and to gain understanding of basic principles.

EM 523   Information Systems   (3-0) 3   7

This course introduces the students to the fundamental concepts and basic principles of Information Systems (IS). These include organizational and technical foundations of IS, building and implementing IS, and managing contemporary IS. Also, topics like e-commerce, e-business, intranets, extranets and other information technologies will be discussed during the course. The main focus of the course will be based on the interconnections between technology, the organization, and IS management.
Information Systems like Management Information Systems (MIS), Enterprise Resource Planning (ERP), Decision Support Systems (DSS), Executive Support Systems (ESS) will also be covered.

EM 524   Introduction to Knowledge Management   (3-0)3   7

Knowledge Management is an interdisciplinary field that promotes an integrated approach. It helps to identifying, managing, and sharing all of organisation's strategic knowledge assets including databases, documents, policies and procedures as well as individual worker's experiences. This introductory course presents a wide spectrum discussion in recognizing and managing knowledge asset base of organizations and cities.

		Credit	**ECTS**

EM 534   Multivariate Statistical Data Analysis   (3-0) 3   7

The course will cover the statistical tools for the analysis of process data. Basics of matrix algebra, statistics and graphical techniques to describe data, normal distribution, test of normality, hypothesis testing will be introduced first. The methods to compare several multivariate population means will be included. Techniques that are used for modeling and monitoring multivariate processes will be covered; linear regression, principal component analysis, factor analysis, discrimination and clustering analysis will be given to model and classify process data, and also to monitor and diagnose the process. Students who want to take this course should be familiar to a software to perform required matrix operations.

EM 535   Statistical Quality Control   (3-0) 3   7

This course will focus on the statistical process monitoring and control techniques used in science and engineering. The content covers statistical process monitoring charts for variables and attributes. Descriptive statistics including mean, standard deviation, variance, probability distributions will be given. The concept of univariate charts such as Shewhart, cumulative sum and exponentially weighted moving average charts will be followed by autocorrelation and cross correlation in process data. The techniques for multivariable processes with correlated data will be introduced. The definition and guidelines of experimental design and factorial experiments will be covered.

EM 536   Design of Experiments and Process Optimization   (3-0) 3   7

This course is about the methods and techniques used in the design and analysis of experiments. It emphasizes the connection between the experiment and the model that the experimenter can develop from the results of the experiment. As an introduction to the course, the fundamental concepts of experimental design, such as randomization and blocking, comparison of treatments, the analysis of variance along with simple graphical techniques will be presented. Factorial and fractional factorial designs with particular emphasis on the two-level design system will be introduced. Fitting regression models, Response surface methods (RSM), which are the tools for process optimization trough designed experiments, and Taguchi methods, will also be covered.

In many industries, the effective use of statistical experimental design is the key to higher yields, reduced variability, and better products. Therefore, it is believed that, this course can be very useful for students from all science and engineering disciplines

EM 541   Total Quality Management   (3-0)3   7

Theory and practice of total quality management; customer satisfaction, continual improvement, management commitment, training, teamwork, statistical methods, cost of quality, supplier involvement, customer service, implementation.

EM 542   Scheduling   (3-0)3   7

Scheduling methods; Gantt charts, CPM, PERT, line of balance method, resource leveling and allocation; network optimization and compression subjects are covered throughout the class. A real case study is conducted in class by using state-of-the-art computer technologies.

EM 544   Technology and Innovation Management   (3-0)3   7

Different perspectives on technology and innovation. Managing technology and innovation. Innovation, invention and discovery. Types of innovation – product vs. process innovation and radical vs. incremental innovation. Connecting technology and innovation to firm strategy. Developing and implementing innovation and technology strategy. Technology and value chain. Technological evolution and forecasting. Assessing innovative capabilities - Innovative Capabilities Audit Model (ICAM). The concept of acceleration trap from social and economic perspectives.

	Credit	ECTS

EM 562   Strategic Management   (3-0)3   7

This course aims to provide future leaders, managers and strategists with an understanding of strategic management that will enable them to function effectively in today's competitive economies. Through case studies and readings, the course exposes future leaders, managers and strategists to (1) the use of strategic concepts to achieve corporate objectives and mission in competitive situations through the use of strategic management concepts, including environmental and industry analysis, and (2) the integrative application of knowledge gained from all of the management disciplines to solve actual management dilemmas.

EM 564   Marketing Management   (3-0)3   7

The course examines core concepts in marketing and marketing-oriented management. It develops competence in the use of modern marketing techniques and their application in the design, development, and commercialization of new products and services in rapidly changing markets. Emphasis is also placed on developing effective communication skills.

EM 565   Principles Of Entrepreneurship   (3-0)3   7

This course aims at familiarizing students with the basic principles of entrepreneurship. It describes entrepreneurship as a comprehensive process and recongizes it as an economic or social value creation rather than the single event of opening a business. In line with recent research, the course primarily focuses on opportunity recognition, capital and human resources needed to develop a new idea and launching the new venture.

EM 566   Managerial Economics   (3-0)3   7

To explain the firm and production management with the basic principles of resource economics and market structure

EM 568   Business Ethics and Negotitation   (3-0)3   7

Ethics is one of the most challenging areas where values are subject to degeneration in business environment (private or public). The aim of this course is to earn the student different perspective other than cognitive knowledge and methods of how to maximize "materialistic" efficiency and profit-making at business environments; the concern is on the way the work or management is executed, the role and contribution of ethics on productivity, and endearing of job as well, the fundamental (universal) principles of ethics and moral values (from Western and Eastern perspectives) of doing right work and right management, honest leadership in transmission of culture of work ethics and motivation, concepts of responsibility, righteousness, accountability (liability), the respect and honesty, etc., the methodology of examining ethical issues and conflicts from various perspectives (deontological and teleological). Another aspect of this view is its strategic notion whether it has satisfaction points and gains which can be understood by gaming approaches (negotiation, bluffing): negotiation "experiments". Also, introducing some cases where ethical conflicts experienced in the World and Turkey.

EM 569   Conflict Management   (3-0)3   7

Basic approaches, strategies and styles in conflict management. The nature of conflict and means for conflict prevention. Negotiation theory. Negotiation tactics and strategies: integrative bargaining model, distributive model and defining BATNA. Developing win-to-win solutions. Building long-term relationships and coping with difficult people. Effective listening and emotional quantity.

EM 571   Organizational Behaviour   (3-0) 3   7

Theory and models of organizational behaviour. Individual, interpersonal, and group dynamics. Management and leadership. Power, influence, motivation; change. Communication channels. Organizational culture.

	Credit	ECTS

EM 573   History of Administrative Philosophy   (3-0)3   7

The seminar aims at introducing the professional manager to the sources of modern administrative philosophy by reading and analysis of selections from major western authors from the Renaissance to the twentieth century. While historically, the selected texts will give a mature sense of major stages in the rise and development of the philosophy of administration in the west and elucidate the main psychological and strategic concepts at work in administrative science, they will also be useful in administrative practice today.

EM 582   Soft Methods for Planing and Management   (3-0)3   7

Artificial neural networks (ANN), genetic algorithms (GA), ant colony (AC), and particle swarm (PS) optimization methods; application of these methods in planning and management problems.

EM 583   Quantitative Methods For Decision Making   (3-0)3   7

This course provides insights into a number of widely used quantitative models in solving managerial decision problems. Specifically, the students will learn how to differentiate various types of decision-making environments and choose the best approach for the problem under study. Topics will include decision analysis, benchmarking, project scheduling, waiting line models, simulation and multi-criteria decision making. Moreover, the interpretation of the various software output related to above quantitative methods and how to use that output in decision-making will be emphasized.

EM 590   Natural Resource Management   (3-0)3   7

The topic includes types of natural resources, energy, renewable resources, depletable resources, water resources management, coal and fossil fuels resources and its management, rock and mineral resources and its management, sustainability, environment and natural resources, perspectives on environmental policy, international market for natural resources.

EM 591   Carbon Management   (3-0)3   7

The aim is to help students to understand the principles of carbon management which causes global warming and to acquire proficiency in applying these principles to solve a variety of practical problems.
Introduction to Carbon Management, Greenhouse gases and global warming, Ways to stabilize Carbon Dioxide in the Atmosphere and Carbon Sequestration, Sequestration in Geological Formations, in Unmineable Coal Seams, in Aquifers, in Abondoned Oil and Gas Fields etc, Sequestration in Ocean, Sequesetration in Terrestrial Ecosystem, Soil and Vegetation, Sequestration by Advanced Chemical and Biological Processes, Stabilization by Alternative Energy Sources, Hydrogen Energy, Nuclear Energy, Wind Energy, Solar Energy etc.. A small design project will be assigned to each student.

EM 593   Catalyst Development   (3-0)3   7

To give information about catalytic materials and their role in industrial chemical production, to show why they are important, how they are prepared and characterised and used as catalysts. This course will also teach how to develop catalytsts and use them in catalytic processes.
The preparation and characterization of catalytic materials are covered. The relationships between the surface and electronic properties and pore structure of the materials and their catalytic activity and selectivity are explained. Types of catalytic materials and parameters to consider in the catalyst development. The link between the catayst properties and reactor selection. Advances in catalyst development and catalyst evaluation. Analysis of some industrial catalytic process, e.g. alkylation, isomerisation, catalytic reforming. Process Overview, Process Chemistry - Feedstock, Reaction, Catalyst Process Variables, Common Problems, Advance in Cat Development, Catalyst Evaluation Techniques.

	Credit	**ECTS**
EM 594   **Catalyst Process Engineering**   (3-0)3   7

This course will develop key concepts and techniques to operate, select and optimize catalytic processes. These key concepts can be utilized to make design and operating decisions. A general overview of the catalytic processes will be given. Reactors design and deactivation will be discussed in detail.

Chemical Reactors, Chemical Reaction Engineering, Thermodynamics of chemical reactions, steps in the catalytic reaction, catalyst deactivation, diffusion and reaction in heteregeneous catalysts and catalytic reactor design will be covered. Catalytic process will be reviewed including; process

description, process variables, reaction chemistry, catalyst development and evaluation. Hydrogenation- Dehydrogenation Processes, Alkylation , Catalytic Oxidation Reactions.

EM 595   **Chemical Process Analysis and Simulation**   (3-0)3   7

Engineering economic analysis of chemical processes. Process optimization. Pinch technology. Tools for evaluating process performance. Performance curves for individual unit operations. Performance of multiple unit operations. Reactor performance. Regulating process conditions. A small term project for each student using professional software packages.

EM 596   **Environmental Management**   (3-0)3   7

Environmental management is a broad discipline devoted to understanding human-environment interactions and the application of science to solve problems. This course aims to introduce core themes and priciples of the subject.

(1) Introduction: Definitions, Fundamentals, Goals, (2) Environmental standards, monitoring, modeling, and management systems, (3) Turkish and European Union environmental laws, (4) Impact, hazard, risk, and environmental impact assessment, (5) Participants in environmental management, (6) Approaches to environmental management, (7) Pollution and Waste Management, (8) Emerging environmental issues, (9) Opportunities in petrochemical industry