***Course Content***

### **ENS 501 Research Methods and Scientific Ethics**

### Scientific research; stages of scientific research methods; setting a scientific hypothesis, collecting data, analyzing and reaching a conclusion; approaches for modeling and formulating a problem to reach a solution; ethics in scientific research; rules and steps in writing a thesis.

### **EM 501 Statistical Analysis for Engineers**

Revıew of probability, random varıables and distributions; random sampling and data description, point estimation of parameters and confidence intervals; hypothesis testing; analysis of variance and design of experiments; regression and response surface analysis. Special emphasis is given to engineering and management problems.

### **EM 502 Operations Management**

Operation strategy, production processes and process design, production logistics, forecasting methods, inventory management, planning and quality management within the scope of operations management and their applications in real business life.

**EM 503 Engineering Project Management**

This course presents the principles and techniques of managing engineering projects, through planning, execution, control and closeout. Students will develop the analytical skills and awareness necessary on the management side of engineering projects. Topics include project initiation, estimating, budgeting, developing work plans, scheduling, tracking work, resource allocation, project coordination, quality management, leadership, managing teams, conflict, negotiations, ethics, and professional responsibility and closeout.

### **EM 504 Advanced Statistical Quality Control**

### Understanding of variation, statistical process control, process improvements through statisticFieldalysis, 7 QC tools, advanced forms of controlcharts (EWMA, CUSUM, Shewhart charts), Moving Range techniques, time series analyses, controlcharts for attribute data, capability studies, process mapping, visualisation techniques for effective decision making, statisticFieldalyses in Exceland MINITAB, measurement system analysis, implementation of performance measurement and control.

### **EM 505 Human Machine Systems Design**

Development of safe, high performance human-machine systems. System/function/task analysis, function allocation, design, mockups and rapid prototyping, human factors test and evaluation. Critical examination of the human-factors and domain-specific literature to identify human factors problems, and knowledge and methods to address those problems.

### **EM 506 Optimization Methods**

Concept of optimization, optimization algorithms, nonlinear programming, gradient reduction method, least squares method, Newton's method, random mutation, simulated annealing, evolutionary algorithms, genetic algorithms, particle swarms, bacterial search, ant colonies, artificial bee colony applications.

### **EM 507 Industrial Data Analytics**

The aim of this course is to apply data analytics techniques in manufacturing and service institutions. In this context, data analytics course, Principal Component Analysis, Regression analysis, classification, clustering analysis, verification, and testing topics. Besides the theoretical discussion of these techniques, sector applications will be shown.

### **EM 508 Stochastic Models in Operations Research**

An introduction to techniques for modeling random processes used in operations research - Markov chains, continuous time Markov processes, Markovian queues, Martingales, Optimal Stopping/Optional Stopping Theorem, Brownian Motion, Option Pricing.

### **EM 509 Advanced System Simulation**

Queue models and basic performance measures; Random Number, Variable and Generation Methods; Monte Carlo Simulation; Discrete event simulation: Modeling and Programming; Statistical Analysis of Input and Output (simulated) Data; Validation and Verification, Variance Reduction Techniques; Comparison of Alternative Systems.

### **EM 510 Financial Management**

This course introduces the role of financial managers, core concepts in corporate finance and financial terminology. Students discuss the financial manager's role within a company, including financing decisions, investing decisions and risk/return tradeoffs. Additional topics include stock valuation, cash flow valuation and project evaluation criteria.

### **EM 511 Fuzzy Decision Making Methods**

Fuzzy sets and logic, Fuzzy set operations, Fuzzy inference and composition, Fuzzy relationship equations, Fuzzy rules, Mamdani, Tagaki-Sugeno and Tsukamoto fuzzy modeling, Fuzzy logic controller structures and design, Fuzzy logic control applications, Fuzzy multi-criteria decision making methods.

### **EM 512 Healthcare Systems Management**

This course aims to teach the student how to solve managerial problems in healthcare systems related to different performance measures. Performance measures may be related to optimization of operation times, minimization of costs, optimization of activity scheduling and others. In particular, operations research, optimization and simulation tools will be used to solve various haelthcare management problems with case applications.

### **EM 513 Cost Management**

Importance and Development of Cost Management, Strategic Cost Management, Current Cost Management Approaches, Activity Based Costing, Cost Management in Just-in-Time Production, Cost in Product Life Cycle, Target Costing, Logistics Costs, Inventory Costs and Management, Quality Costs, Standard Costs and Cost Control, Budgeting and Performance Management, Cost Management Information System.

### **EM 514 Lean Manufacturing and Six Sigma**

Historical Development of Lean Thinking, Lean Production Philosophy, Lean Production Principles, Lean Production Techniques, Lean Production Culture, Value, Wastes, Elimination of Wastes, Determining Problems, Continuous Improvement, Drawing System, Value Flow Mapping, Shortening Production Flow Times, BFieldcing Production, Production and Inventory Control, Cellular Production, 5S system, Performance Measurement.

### **EM 515 Information Systems Management**

The course provides a foundation in the theory and practical application of information systems within an organization. Managing, analyzing, designing, and implementing an MIS will be the focus of the course. Strategic value, methodologies, quality, decision making, modeling, re-engineering, software, hardware, and ethics will in relation to IS will be discussed.

### **EM 516 Business Intelligence**

Introduction to Business Intelligence, Fundamentals of Business Intelligence, Types of Business Intelligence, Data Architecture, Introduction to Data Mining, Data Mining Techniques, Data Warehouse, Data Warehouse Types, Information Management, Business Intelligence Cycle, Business Intelligence User Model, Problems and Challenges in Business Intelligence, Business Intelligence Strategy and Roadmap, Business Intelligence Applications.

**EM 517 Quality Engineering Management**

Concept of quality, development of quality concept, global competition and new management paradigms Differences between total quality management and classical management Total quality management philosophy and principles Total quality management tools Total quality management applications Quality control circles Implementation of total quality management Leadership and importance of total quality management Total quality management success

factors, criticism on total quality management, total quality management in Turkey, quality awards in quality practice.

**EM 518 Customer Relationship Management**

Importance of customer relationship management / CRM culture and restructuring / Integration of human resources and customer relationship management / New dimensions of customer relations / Customer acquisition and retention / Measurement of customer relations / Organizational culture and change / Customer oriented management Approach.

### **EM 519 Quantitative Models in Supply Chain Management**

Economies of scale in the supply chain, quantity and transportation discounts. Multi-stage inventory and production systems, risk pooling, decentralized and centralized modeling approaches, bullwhip effect. Supply chain coordination, strategic games in supply chains, and contracting. more complicated examples from industry. Decision-making and information management issues in supply chains with emphasis on integrating procurement, operations, and logistics; stages from raw materials to customer demand, with emphasis on quantitative models of supply chain.

**EM 520 Industry 4.0 Applications**

Introduction to Industry 4.0, Digitalization and Challenges for Industry 4, Comparison of Industry 4.0 Factory and Today's Factory, Trends of Industrial Big Data and Predictive Analytics, Industrial Internet of Things (IIoT), Smart Manufacturing, Smart Supply Chain Logistics,  Cyberphysical Systems, Robotic Automation and Collaborative Robots, Role of data, information, knowledge and collaboration in future organizations, Cloud Computing and Industry 4.0

**EM 521 Communication Skills for Engineers**

Engineers who want to advance in their profession need to be effective communicators. They need to clearly communicate complex ideas and technical project plans. They also need to be strong persuaders. Engineers who are good communicators get recognized by their supervisors and by their clients. In this course, students will explore how to handle difficult conversations, how to handle crisis communication, practice solving case studies and building teams, designing and giving strong, persuasive presentations.

**EM 522 Creativity, Innovation, and Design**

This course presents contemporary views of creativity, innovation and design and their importance within organizations and business that are increasingly characterized by risk and uncertainty. Students will examine the need to manage these activities through the application of theory and the introduction of practices and processes to achieve sustainable competitive advantage. They will also explore the innovation imperative, creative problem-solving approaches, design thinking, innovation process management, and innovation performance measurement.

**EM 523 Healthcare Quality Management**

This course teaches the student basic concepts in healthcare quality. Causes of errors in healthcare systems will be discussed in detail. Use of various statistical tools in healthcare quality management are presented. Patient safety, cause and effects analysis, and root cause analysis of errors in healthcare systems are presented. Effects of various healthcare policies on healthcare quality will be discussed.

**EM 524 Risk Assessment and Management**

This course introduces the concepts and general principles of risk analysis, assessment and management in engineering systems. The course discusses the qualitative risk identification methods and the quantitative risk assessment methods and techniques. It also explains in a detailed approach the risk management strategy and the process of managing risks, starting by the identification stage, and followed by the initial assessment and the response and mitigation stage.

**EM 525 Economic Analysis**

Project initiation and development, review of practical decision-making problems and relevant techniques, benefit/cost analysis, time value of money, Nominal and effective interest rate, calculation involving multiple interest formulae, internal rate of return, payback period method, comparisons of alternative investments, depreciation methods, income tax consideration, inflation, replacement analysis, sensitivity analysis, life-cycle costing, economic analysis of projects.

**EM 526 Safety Engineering Management**

The aim of the subject is to provide principles and theory of hazard and qualitative hazard assessment of equipment and technologies, and knowledge on the influence of risk on the environment. The subject offers more sophisticated hazard and risk assessment tools necessary for the elaboration of accident plans and the investigation of accidents.

**EM 527 Reliability and Maintenance Management**

The course intends to expose the students to the concept of reliability and help them learn the techniques of estimating reliability and related characteristics of components. Mean time to failures and failure rate estimations, renewal process, and analysis of reliability of complex systems. Maintenance, availability, and maintenance management systems.

### **EM 528 Multi Criteria Decision Making**

Determination of alternatives, criteria, and weights for complex decisions. Analysis of multi criteria decision making methods such as AHP, TOPSIS, ELECRE, and PROMETHEE. Fuzzy multi criteria decision making approaches. Using goal programming in multi criteri decision making.

**EM 580 Selected Topics in Engineering**

In depth study of selected topics in the area of Engineering Management.

**EM 590 Graduate Seminar**

A series of lectures in Engineerin Management is given by faculty members or outside speakers.

### **EM 595 M. S. Thesis**

### **EM 596 Term Project**