ISTANBUL COMMERCE UNIVERSITY
DEPARTMENT OF INDUSTRIAL ENGINEERING
UNDERGRADUATE COURSE DESCRIPTIONS

SEMESTER 1
Compulsory Courses (Theory–Practice | Credits | ECTS | Group)

LNG101 General English I (2–0 | 2 | 2 | G)
Unit opener; topic preview; vocabulary preview; reading; reading check; vocabulary check; applying reading skills; discussion of each reading topic; technology in use; materials technology; components and assemblies; engineering design; breaking point; technical development; procedures and precautions; monitoring and control; theory and practice; pushing the boundaries.

GNL105 Turkish Language I (2–0 | 2 | 2 | G)
Develops the ability to communicate accurately, clearly, and effectively in both oral and written forms.

FEF111 Physics I (3–0 | 3 | 4 | T)
SI unit system and dimensional analysis; vector operations; kinematics; Newton's laws and applications; applications of static equilibrium; work, energy, and power; momentum and types of collisions; dynamics of rotational motion; angular momentum; waves, oscillations, and wave dynamics.

FEF121 Physics Laboratory I (0–2 | 1 | 3 | T)
Measurement and uncertainty; error analysis; unit and dimensional analysis; SI unit system; standards of length, mass, and time; interpretation of data through graphical analysis; familiarization with mechanical measuring instruments; taking measurements and conducting error analysis; experiments on simple pendulum and spring systems; 2D projectile-motion experiments using computer-based sensors; experiments on statics and rotational dynamics.

MAT121 Mathematical Analysis I (4–0 | 4 | 7 | T)
Functions; limits; continuity; differentiation; rules of differentiation; applications of derivatives; integration; definite integrals and their properties; applications of integrals; improper (generalized) integrals.

ENM111 Introduction to Industrial Engineering (3–0 | 3 | 4 | M)
Historical development and contemporary definition of Industrial Engineering; systems approach; scientific approach; definition and calculation of productivity. Facility location and location-allocation methods in manufacturing and service systems. Definition and classification of production systems (manufacturing and services); workplace layout methods; assembly line balancing problems. Costs and break-even analysis. Interest; time value of money; compound and simple interest; present and future value for single-payment cash flows; interest factors. Method study; graphical

tools and diagrams used in work analysis; principles of motion economy; therblig symbols. Time study; standard time concept; allowances and performance rating. Demand forecasting. Independent-demand inventory models. Dependent demand, Master Production Schedule, and the MRP approach. Production scheduling problems and solution algorithms. Operations Research techniques: linear programming and transportation models. Probability concepts; probability distributions; normal distribution; reliability.

BIL109 Computers and Information Systems (3–0 | 3 | 4 | M)
History and evolution of computers; number systems (binary, octal, hexadecimal); computer hardware; central processing unit; peripheral devices; computer networks; wired and wireless access systems. Computer software: system software and application software; text-based and graphical user interface operating systems. Text editors; presentation software; spreadsheet software and its use in scientific applications. Traditional file systems. Excel spreadsheets and MATLAB software.

ENG113 Introduction to Economics (3–0 | 3 | 4 | M)
Introduction to economics; economic models; economic systems; laws of supply and demand and the price mechanism; supply and demand elasticities and applications. Consumer behavior; budget constraint; utility theory; consumer equilibrium; general equilibrium. Perfect competition; monopoly; monopolistic competition; oligopoly. Macroeconomics and national income; economic growth; unemployment; inflation; macroeconomic equilibrium; aggregate demand and aggregate supply analysis; fiscal and monetary policies.

SEMESTER 2
Compulsory Courses (Theory–Practice | Credits | ECTS | Group)

LNG102 General English II (2–0 | 2 | 2 | G)
Unit opener; topic preview; vocabulary preview; reading; reading check; vocabulary check; applying reading skills; discussion of each reading topic; technology in use; materials technology; components and assemblies; engineering design; breaking point; technical development; procedures and precautions; monitoring and control; theory and practice; pushing the boundaries.

GNL106 Turkish Language II (2–0 | 2 | 2 | G)
Develops the ability to communicate accurately, clearly, and effectively in both oral and written forms.

FEF112 Physics II (3–2 | 4 | 7 | T)
Coulomb's law; concepts and applications of electric field and electric potential; Gauss's law; capacitors and technical application areas; DC circuit analysis concepts and applications. Fundamental concepts of magnetism and engineering applications; interaction among charge, current, and magnetic fields; induction currents and

technical applications. Fundamental concepts and applications of AC circuit elements; series–parallel RLC circuit analysis; phasor diagrams; introduction to Maxwell's equations and oscillation equations. Core concepts of electricity and magnetism.

FEF122 Physics Laboratory II (0–2 | 1 | 3 | T)

Measurement and error analysis using ammeter, voltmeter, ohmmeter, and oscilloscope; basic electrical circuit components; Kirchhoff analysis of series–parallel circuits; application of Ohm's law; RC circuit; determination of the magnetic force acting on a current-carrying conductor; transformer; RLC circuit analysis.

MAT122 Mathematical Analysis II (4–0 | 4 | 7 | T)

Sequences and series; power series; series expansions of functions; vectors; matrices and determinants; vector-valued functions; multivariable functions; partial derivatives; double and triple integrals; work and line integrals; Green's theorem; surface integrals; Stokes' theorem; divergence theorem.

ENG102 Technical Drawing (2–2 | 3 | 5 | M)

Introduction to design; design factors; 2D drawing applications; fits; 2D drawing problems; design materials and stresses; advanced drawing commands; fatigue and fasteners; sketching; springs; orthographic views; rolling bearings and plain bearings; sectional views; gears. Dimensioning: linear, angular, and circular. Clutches; brakes; tolerances; couplings; geometric tolerances; flexible machine elements; 3D drawings; shafts.

BIL209 Computer Programming (3–1 | 3.5 | 4 | M)

Flowcharts and algorithms; algorithm examples; evolution of programming languages and the role of Python. Constants and variables in Python; development environment; assignment statements; basic input–output statements; structured programming constructs; object-oriented approach; built-in functions and user-defined functions; debugging; file operations.

CHE101 General Chemistry (2–1 | 2.5 | 3 | T)

Solids, liquids, and gases; van der Waals, hydrogen, ionic, coordinate, and covalent bonds; intermolecular forces. Avogadro's constant; molecular and equivalent weights; mechanisms of chemical reactions; solubility rules. Isotopes; capillarity; normal and molar solutions; distillation; acids, bases, and salts; pH. Titration; gravimetry; redox reactions. Electrochemistry; batteries; corrosion. Environmental chemistry; industrial polymers. Laboratory: equipment and materials and their use; pH paper and pH meter; preparation of solutions; dilution (adding water to acids and bases); precipitation reactions; filtration; and applications related to reaction formation.

SEMESTER 3
Compulsory Courses (Theory–Practice | Credits | ECTS | Group)

GNL101 Atatürk's Principles and History of Reforms I (2–0 | 2 | 2 | G)

Evaluates the phases Türkiye has undergone since the establishment of the Republic, its relations with other countries, and its initiatives toward participation in contemporary civilization.

ENG126 Engineering Mathematics I (3–0 | 3 | 5 | T)

Linear systems of equations, matrices, and matrix operations with engineering applications. Solution of linear systems. Determinants and their properties. Real vector spaces; linear independence; homogeneous systems. Eigenvalues and eigenvectors and their various applications in engineering.

ENM213 Work Analysis and Design (3–0 | 3 | 6 | M)

Introduction and fundamental concepts (Groover, Chapter 1). Work systems and manual operations (Groover, Chapter 2). Workflow and batch processing/lot production (Groover, Chapter 3). Standard time calculations and applications in mass production and assembly lines (Groover, Chapter 4). Method engineering (Groover, Chapter 8). Charting and tabular techniques (Groover, Chapter 9). Principles of motion study (Groover, Chapter 10). Direct time study and work measurement (Groover, Chapter 13). PMTS (Groover, Chapter 14). Work sampling (Groover, Chapter 16). Economic analysis and summary.

ENM207 Probability and Statistics I (3–0 | 3 | 6 | T)

Introduction to probability and randomness. Definition of sample spaces; events and probability; counting rules. Conditional probability; independence; Bayes' theorem. Random variables; functions of random variables; expected value and variance. Major discrete random variables/distributions (discrete uniform, Bernoulli, binomial, geometric, negative binomial, hypergeometric, Poisson). Continuous random variables; cumulative distribution functions and probability density functions. Major continuous distributions (uniform, normal, exponential, Erlang, gamma, Weibull, beta). Normal approximation to binomial and Poisson. Joint probability distributions; marginal and conditional distributions. Independent random variables. Conditional expectation. Covariance and correlation.

BIL242 Database Systems (3–0 | 3 | 5 | M)

Needs for data storage and access; classical file systems and examination of their limitations. History of database systems; types of database systems; advantages of database systems; widely used contemporary database systems. Components of relational database systems; relational algebra; relations. Entity–relationship diagrams and mapping ER diagrams to relational tables. Introduction to SQL as a data query language. Introduction to the selected application tool (MS Access). SQL and SQL functions: types and usage examples. Normalization (first, second, and third normal forms) and application examples. SQL data definition and control features; backup and recovery. Application development example.

ENM309 Manufacturing Methods (3–0 | 3 | 6 | M)
Principles and classification of manufacturing methods; comparison of methods, advantages, and limitations. Design–manufacturing relationship. Selection of manufacturing methods. Casting, welding, plastic forming, machining, and powder metallurgy manufacturing processes.

SEMESTER 4
Compulsory Courses (Theory–Practice | Credits | ECTS | Group)

GNL102 Atatürk's Principles and History of Reforms II (2–0 | 2 | 2 | G)
Evaluates the phases Türkiye has undergone since the establishment of the Republic, its relations with other countries, and its initiatives toward participation in contemporary civilization. Also introduces the process of proposing an initiative and transforming it into a business plan, as well as e-commerce methods and tools.

ENG212 Engineering Economy (3–0 | 3 | 6 | M)
Modeling; models and assumptions in engineering economy. Investment concept. Simple interest; compound interest; equivalence and the time value of money. Cash flow diagrams. Cash flow calculations: uniform cash flows and single-payment series. Effective and nominal interest rates. Debt repayment. Present worth analysis and comparison of alternatives. Fundamental evaluation methods: present worth, future worth, and annual worth. Internal rate of return; profitability index; payback period. Sensitivity analysis and break-even analysis. Effects of inflationary environments on investment decisions. Replacement (renewal) investments. Estimation of the economic life of investments. Depreciation and the impact of income taxes on investment decisions.

ENG227 Engineering Mathematics II (3–0 | 3 | 5 | T)
First-order differential equations: differential equations and mathematical models; integrals as general and particular solutions. Mathematical models and numerical methods. Higher-order linear differential equations; mechanical vibrations; non-homogeneous equations and the method of undetermined coefficients. Introduction to systems of differential equations: first-order systems and applications. Linear systems of differential equations. Laplace transform methods.

MUD203 Managerial Accounting (3–0 | 3 | 5 | M)
Understanding and managing costs and expenses in manufacturing and service organizations. Developing the information infrastructure required to classify costs and expenses and to define their relationship with profits. Enhancing competencies to present financial information to support managerial decision-making.

ENM208 Probability and Statistics II (3–0 | 3 | 6 | T)
Review of probability. Data collection, summarization, and exploration. Sampling distributions of selected important statistics. Core topics in statistical inference.

Statistical inference: one-sample and two-sample procedures, proportions, and count data. Estimation and hypothesis testing. Regression analysis. Fundamentals of experimental design. Analysis of variance (ANOVA). Nonparametric statistics.

ENM214 Project Management (3–0 | 3 | 6 | T)
Project definition; distinctions between projects and routine operations; management and project management; illustrative projects. Team and organizational structures in projects: pure project organization, hybrid organization, and matrix organization. Risk definition; project risk management; sources of risk; risk identification. Work Breakdown Structure (WBS). Network definition and project network analysis. Critical Path Method (CPM) and Program Evaluation and Review Technique (PERT). Gantt charts and identification of critical/urgent activities. Activity crashing models. Introduction to Microsoft Project and project modeling using Microsoft Project.

GNL301 Internship I (0–0 | 0 | 5 | M)
Internship I.

SEMESTER 5
Compulsory Courses (Theory–Practice | Credits | ECTS | Group)

ENM301 Operations Research I (4–0 | 4 | 6 | T, M)
History and development of Operations Research; deterministic and probabilistic models; the art of model building and problem solving; the role of linear programming in mathematical programming. Linear decision models and their formulation; solution of linear programming models using graphical, algebraic, and simplex methods, including the two-phase simplex and Big-M methods. Duality and the dual simplex method. Sensitivity analysis; the revised simplex method; computer-based applications for solving linear programming models. Transportation models (balanced and unbalanced) and solution approaches (heuristics, VAM, RAM). Assignment problems.

ENM303 Production Systems (3–0 | 3 | 5 | M)
Course overview and historical development of production systems. Classification of production systems (traditional systems). Modern production systems: cellular manufacturing and group technology. Cell formation methods. Flexible manufacturing systems and computer-integrated manufacturing systems. Lean production and agile manufacturing. Contemporary paradigms: World Class Manufacturing (WCM), fractal production, and holonic production. Facility layout methods (CRAFT, ALDEP, CORALAP). Facility layout and assembly line balancing.

ENM307 System Simulation (2–2 | 3 | 5 | T, M)
Real systems, models, and simulation. Probability theory and statistics for simulation. Distribution functions; inverse transform method; random number and random variate generation. Discrete-event simulation using spreadsheets; discrete-event simulation using MATLAB. Modeling and simulation with Arena, including Arena Process Panel

modules. Numerical simulation case studies. Analytical simulation and Simulink. Analytical simulation of mechanical systems and analysis of system outputs. Output analysis; validation and verification.

ENM225 Industrial Management and Organization (3–0 | 3 | 4 | M)
Contemporary business environment. General definition of management; analysis of the external and internal environment of organizations. Types of enterprises and legal structures. Inter-organizational mergers, acquisitions, and collaborations. Core functions of management: planning, organizing, leading/motivating, and controlling. Accounting management and financial management in organizations.

SEMESTER 6
Compulsory Courses (Theory–Practice | Credits | ECTS | Group)

ENM302 Operations Research II (4–0 | 4 | 6 | T, M)
Fundamental concepts in modeling and optimization. Network models and algorithms: minimum spanning tree, shortest path, minimum-cost flow, and maximum flow. Applied solutions using Excel and GAMS. Goal Programming and GAMS applications. Integer linear programming and GAMS applications: branch-and-bound method; Gomory cutting planes; Dantzig cutting planes; Lagrangian relaxation. Deterministic dynamic programming.

ENM312 Systems Analysis and Design (2–2 | 3 | 7 | M)
Process–knowledge area matrix in project management; project life cycle and project design. Types of enterprises and projects; project cycle and analysis studies; market analysis. Demand forecasting; feasibility studies and iterative analyses. Information gathering methods: review of written/printed documents and face-to-face interviewing. Statistical and distribution-function-based methods for success probability and risk analysis during project and operational phases. Human resources and project team management; Work Breakdown Structure; task lists; network and time planning. Use of Gantt and PERT/CPM; probability/likelihood of project completion. Hardware, software, equipment, material, and energy requirements in project and operational phases. Analysis of resource utilization in complex systems (human, hardware, software, materials, energy). Revenue–cost studies; discounted cash flow methods. Environmental, occupational health and safety, and legal responsibilities in project management and workplace applications.

ENM304 Production Planning and Control (3–0 | 3 | 6 | M)
Process analysis. Demand forecasting methods: quantitative techniques, moving averages, exponential smoothing, and trend analysis. Measurement of forecasting errors: MAPE, MAD, and bias metrics. Deterministic inventory control models under independent demand: ABC analysis; economic order quantity and reorder point calculations; determination of optimal order quantities under quantity discounts. Probabilistic inventory control models: service levels, order quantities, continuous and

periodic review systems, and analysis of single-period inventory models. Aggregate production planning strategies: graphical and tabular approaches; transportation model approach. Mathematical programming techniques used in production planning: linear programming solutions. Dependent vs. independent demand; product structure (bill of materials) and material requirements; lot-sizing rules. MRP (Material Requirements Planning) and CRP (Capacity Requirements Planning). Scheduling algorithms: Gantt charts, performance measures, Johnson's rule; scheduling in n-job, m-machine environments; workforce scheduling algorithms.

ENM308 Quality Engineering (3–0 | 3 | 6 | M)
Introduction to Total Quality and Just-in-Time (JIT) approaches, which play a key role in the transition from traditional production and human resource management to Lean Production, a paradigm originating in Japan and widely adopted worldwide. Quality concepts, evolution, and quality systems. Total Quality Management. Quality Circles; Deming's quality principles; PDCA (Plan–Do–Check–Act) cycle and continuous improvement. Probability distributions and statistical inference. Statistical Process Control. Inspection and specifications. Quality improvement tools (seven basic quality tools). Control charts for attributes: p, np, c, u. Control charts for variables: MR, median, R, and others. Specialized control chart types (MA, CUSUM, EWMA, Shewhart). Process capability analysis. Acceptance sampling. Design of experiments. Six Sigma.

GNL302 Internship II (0–0 | 0 | 5 | M)
Internship II.

SEMESTER 7
Compulsory Courses (Theory–Practice | Credits | ECTS | Group)

ENG401 Design Project (0–4 | 2 | 9 | M)
Students are expected to present their work by following systematic steps, including the identification of a need, problem definition, analysis, and the development of a feasible and/or optimal system solution.

ENM427 Supply Chain Management (3–0 | 3 | 6 | M)
Supply chain concept, basic definitions, and historical development. Supply chain drivers. Supply chain performance measurement. Sourcing decisions in supply chains. Fundamentals of supply chain network design. Network design: facility location problems (p-median, set covering, main distribution hub). Facility location–allocation problems (uncapacitated, capacitated, multi-echelon). Stochastic network design. Multi-objective network design (multi-objective MILP, epsilon-constraint method, goal programming). Vehicle routing and traveling salesman problems in network design. Demand forecasting in supply chain management (Holt's method, Winters' method, regression). Demand forecasting using Box–Jenkins methodology.

SEMESTER 8
Compulsory Courses (Theory–Practice | Credits | ECTS | Group)

ENG402 Graduation Project (0–4 | 2 | 9 | M)
The graduation project is conducted individually or in teams under the supervision of a faculty member. Students are required to meet with their supervisors weekly to exchange ideas and receive guidance. A preliminary report, a midterm report, and a final report are required.

ENM404 Production Scheduling (3–0 | 3 | 6 | M)
General concepts related to production systems and scheduling. Types and characteristic features of scheduling problems. Single-machine scheduling (algorithms and use of the LEKIN software). Single-machine scheduling (heuristic methods). Parallel-machine scheduling (heuristic algorithms). Flow-shop scheduling (Johnson's algorithm, CDS heuristic; Palmer heuristic; NEH algorithm; branch-and-bound algorithm). Job-shop scheduling (bottleneck shifting heuristic and LEKIN).

GNL450 Career Planning (2–0 | 2 | 0 | M)
Entrepreneurship; intelligence and personality; productivity challenges; opportunities in the age of digitalization; course website video materials; communication skills; competencies expected of future engineers; lifelong learning; engineering and ethics; seminars on sustainable development.

FALL SEMESTER – IN-DEPARTMENT ELECTIVES

ENG211 Numerical Analysis (3–0 | 3 | 5 | M)
Introduction to MATLAB. Vectors and matrices. Excel and MATLAB applications in engineering economy. Introduction to numerical analysis; definition of error. Solution of linear systems: direct and iterative methods. Solution of nonlinear equations and nonlinear systems. Finite difference and interpolation techniques. Lagrange interpolation polynomial for unequal intervals. Curve fitting. Numerical differentiation and numerical integration. Numerical solution of differential equations. Partial differential equations and their classification.

ENG309 Sustainability and Environment (3–0 | 3 | 5 | G?)
Overview of human–environment relationships; conceptual framework of architecture and the environmental interdisciplinary field. Architectural design and ecology concepts. Principles of sustainable architecture and sustainable architectural design. Ecological design and foundations of sustainable design. Ecological framework of architectural design and principles of ecological architectural design. Effects of the built environment and buildings on ecological balance, natural life, and human health. Concepts of sustainable environment and ecological building design. Criteria for ecological construction. Introduction to examples of ecological urban development and ecological architectural design; presentation of ecological building examples.

Ecological practices in traditional architecture and their potential and sustainability in contemporary design; sustainability of new building typologies originating from traditional approaches.

ENM313 Decision Analysis (3–0 | 3 | 5 | M)
Types of decision making. Decision making under uncertainty: maximin, minimax, maximax, Hurwicz, and Laplace criteria. Decision making under risk: concepts of risk and uncertainty and decision criteria; expected value criterion; expected opportunity loss. Decision trees. Game theory: fundamental concepts; pure-strategy equilibrium in games; mixed-strategy equilibrium in games. Markov analysis. Utility theory.

ENM341 Business Analytics (3–0 | 3 | 5 | M)
Introduction to fundamental business analytics problems and common data types. Python in business analytics. Data reporting and visualization methods. Data preprocessing techniques. Clustering methods: k-means and hierarchical clustering. Classification methods: k-nearest neighbors and Bayesian classification. Support vector machines. Decision trees. Model selection criteria. Text mining. Reinforcement learning. Representative business analytics applications.

ENM360 Digital Transformation in Industry (3–0 | 3 | 5 | M)
History of industrial revolutions and digital technology. The concept of digital transformation and its relationship with innovation. Industry 4.0 and its characteristics. Cloud computing. Internet of Things (IoT). Cyber-physical systems. Data science and big data analytics. Smart factories. Information technologies and digital transformation. Artificial intelligence and machine learning. Digital traceability systems in production and service processes. Business model innovation with smart and connected products. Autonomous systems and decentralized decision-making processes. Formation of digital ecosystems and smart production systems. Machine-to-machine communication. Interoperability; information transparency; technical assistance. Simulation systems.

ENM361 Forecasting Methods (3–0 | 3 | 5 | T, M)
Overview of forecasting methods. Characteristics of time series. Trend analysis. Decomposition analysis. Moving average technique. Non-seasonal exponential smoothing methods. Seasonal exponential smoothing methods. Pegels' classification for exponential smoothing. Identifying the characteristics of a time series. ARMA models for stationary time series. Stationarization of time series. ARIMA models.

ENM363 Design of Experiments (3–0 | 3 | 5 | M)
Introduction to experimental design. Fundamental statistical methods. Mean comparisons using hypothesis tests. Analysis of variance (ANOVA). One-way analysis. Determination of sample size. Test power and blocking. 2^k factorial designs. 3^k factorial designs. Factorial designs. Fractional factorial designs. Latin square and Graeco-Latin square designs.

ENM365 Materials Science (3–0 | 3 | 5 | M)
Materials and engineering; classes of materials; materials in Industrial Engineering and engineering applications. Atomic structure and bonding. Crystal structures and crystallography. Mechanical properties of metals: tensile and hardness testing; compression and torsion testing; creep and fatigue testing. Phase diagrams; Gibbs phase rule; lever rule (pure materials and binary eutectic systems). Engineering alloys. Iron and steel production. Plain carbon and low-alloy steels. Iron–carbon equilibrium diagram and related calculations. General heat treatments of steels. Aluminum alloys; copper alloys; stainless steels; cast irons. Material selection for engineering designs involving metallic materials.

BIL452 Artificial Intelligence (3–0 | 3 | 5 | M)
Introduction to artificial intelligence and fundamental concepts. Problem solving; theorem proving. Search methods. Learning. Application areas of AI: expert systems, image analysis, robotics, computer perception, natural language processing, speech recognition, and fuzzy logic.

ENM413 New Product Development (3–0 | 3 | 5 | M)
New product strategies in firms; product mix and product line. Importance of new product development. Organization of new product development activities. Product development process. Generation of new product ideas; concept design; design development; prototype development and testing. The role of design in the new product development process. Analysis of new product development practices with examples from Türkiye and international contexts.

ENM419 Inventory Management and Cost Analysis (3–0 | 3 | 5 | M)
Begins with fundamental topics in cost accounting. Covers product cost determination, cost of goods sold determination, and detailed variance analysis.

ENM421 Investment Planning (3–0 | 3 | 5 | M)
Economic definitions and concepts. The role of the firm within the economy. Investment planning and economic systems. Factors of production and major production activities. Incentive instruments applied in Türkiye. Investment planning and project concepts. Preparation of investment projects from economic, technical, and financial perspectives. Evaluation of investment projects. Cost calculations; profitability analyses; depreciation. Applied feasibility study.

ENM423 Operations Research III (3–0 | 3 | 5 | T, M)
Introduction. Stochastic processes. Markov chains and transition matrices. Classification of states in Markov chains; steady-state analysis. Transient systems and absorbing states. Queueing models. Nonlinear programming. Heuristic methods.

ISL427 Marketing (3–0 | 3 | 5 | M)
Competition and industry analysis. Segmentation management. Product and innovation

management. Brand management. Pricing management. Management of distribution systems. Marketing strategies. Marketing organization. Marketing performance management. Customer equity management. Social media marketing. E-commerce management. Sales management.

HUK444 Labor Law (3–0 | 3 | 5 | G)
Rules governing social order; legal rules; the concept of rights; legal capacity and capacity to act; legal transactions; principles of good faith and honesty. Duties and jurisdiction of judicial bodies; principles of civil law. Individual labor law and collective labor law regulations.

ENM453 Mathematical Programming (3–0 | 3 | 5 | T, M)
Introduction to mathematical programming software. Formulation of mathematical models in closed form; closed-form writing practices. Introduction to GAMS. Coding mathematical models in GAMS; coding applications. Interpretation of GAMS solution reports. Conditional statements in GAMS. Reading parameter values from Excel. Writing results to an output file. Algorithm implementation in GAMS.

ENM455 Heuristic Methods in Optimization (3–0 | 3 | 5 | M)
Introduction to optimization problems. Basic search methods. Divide-and-conquer-based approaches and related methods. Greedy algorithms. Nearest neighbor; CIH; FIH; savings algorithm and related heuristics. Simulated annealing. Tabu search. Ant colony optimization. Genetic algorithms. Particle swarm optimization. GRASP. Other methods and techniques: neural networks, randomized methods, and hybrid/metaheuristic approaches.

ENM457 Strategic Management (3–0 | 3 | 5 | M)
Definition of strategy. Explanation of the concepts of purpose, objectives, vision, mission, policy, and tactics, and their relationships with strategy. Strategic management concept and the evolution of strategic management thought. Importance and benefits of having a strategy for organizations. Strategic decisions in organizations. Planning concept, planning principles, and types of planning. General environment analysis: political trends and their implications for strategic management; economic analyses; socio-cultural factor analysis; technological factors. Industry/competitive environment analysis: assessment of opportunities and threats; factors affecting competition; competitive analysis; techniques for environmental analysis. Importance and scope of business valuation; valuation of firms. Methods for analyzing strengths and weaknesses. Strategic alternative types for firms or strategic business units: growth strategies, stability strategies, retrenchment strategies, and mixed strategies. Definition of globalization; global strategy concept; transition from global strategy to hybrid strategy; selection of global and international strategies. Importance of organizational structure in strategy implementation; reasons for developing and aligning structure with strategy.

Organizational culture concept; relationships with other concepts; importance of organizational culture; classification of organizational cultures.

ENM459 Financial Management (3–0 | 3 | 5 | M)

Financing function and its historical development. Fundamental principles of finance and structures of financial management. Financial markets and the financial markets in Türkiye. Financial instruments and major financial risks. Basic financial statements and their users. Principles of the balance sheet and income statement. Methods of financial statement analysis: ratio analysis, comparative statement analysis, common-size (percentage) analysis, and trend analysis. Break-even analysis. Leverage analysis. Equity valuation and bond valuation.

FALL SEMESTER – OUT-OF-DEPARTMENT ELECTIVES

GNL313 Occupational Health and Safety (3–0 | 3 | 5 | G)

Concept and importance of occupational health and safety; required actions, responsibilities, and roadmap. Obligations to inform and train employees. Management system fundamentals. Risk analysis and assessment. Information and data collection. Preparation of workplace emergency action plans. Preparation of annual workplace plans. Occupational diseases and work accidents. Nutrition information. Prevention of occupational diseases. Visible and hidden damages in work accidents and occupational diseases. Legal regulations related to health, safety, and environment; laws and regulations.

ENM434 Research Methods (3–0 | 3 | 5 | G)

Scientific research and the scientific method. Research design and research process. Statistical definition of the research problem. Development and implementation of a research plan. Data collection methods and techniques; data sources. Data analysis and interpretation. Preparation of the research report.

ENG405 Philosophy of Engineering (3–0 | 3 | 5 | G)

Are engineers builders or thinkers? Are failures the foundations of success? Continuity of traditional approaches. Shared values for aesthetics and ethics. Is technology value-neutral? From philosophy to engineering. Can practice-based knowledge be formalized? Is knowledge acquired by thinking or by doing?

SPRING SEMESTER – IN-DEPARTMENT ELECTIVES

ENM306 Ergonomics (3–0 | 3 | 4 | T)

Definition of work systems; productivity measurement. Manual work systems; worker–machine systems and cycle time; determining labor and machine requirements. Definition, objectives, and application areas of ergonomics. Approaches to adapting work to the worker and/or adapting the workplace to the employee. Ergonomic analysis of human–machine systems. Anthropometry; ergonomic design; product development. Human physiology: metabolism and energy expenditure; muscles; cardiovascular and

respiratory systems. Overview of cumulative trauma disorders arising during work (e.g., disc herniation, carpal tunnel syndrome). Occupational safety: ergonomics laboratory visit or invited guest lecture. Human sensory systems and information processing; perception (cognitive ergonomics) and illustrative applications. Physical work environment: lighting and noise. Physical work environment: climatic conditions. The role of physical environmental effects in design.

ENM312 Enterprise Resource Planning (3–0 | 3 | 5 | M)
Business processes and the evolution of ERP; fundamental concepts. Core modules of ERP systems: Accounting and Financial Management; Materials Management (Purchasing, Inventory, and Warehouse Management); Sales and Distribution; Production Data Management (Bills of Materials and Routings/Workflows); Production Planning (MPS, MRP, CRP); Production Control. Quality and Maintenance Management modules. Supplier Relationship Management (SRM) and Customer Relationship Management (CRM). Corporate Performance Management (Balanced Scorecard). Human Resources Management. Introduction to ERP packages (e.g., SAP, Microsoft Dynamics) and related applications.

ENM314 Industrial Automation (3–0 | 3 | 5 | M)
Industrial control systems; SCADA systems. Relay logic; sensors; secondary transducers; amplifiers. Programmable Logic Controllers (PLCs). Industrial robots. Pneumatic and hydraulic systems. Servo motors. CNC systems. Automatic control. Use of CAD and MATLAB software.

ENM319 System Dynamics (3–0 | 3 | 5 | M)
Open-loop and closed-loop operation. Constant and time-varying reference signals. Block diagrams and signal flow. System components. Mechanical, hydraulic, thermal, and electrical systems. Impedance and transfer/input functions. Proportional elements, capacitive elements, time-constant elements. Stability. Frequency response. Root locus.

BIL304 Management Information Systems (3–0 | 3 | 5 | M)
Fundamental system concepts. Interactions between Management Information Systems and individual/organizational behavior. Information systems implementers and applications. Functional systems. Decision support systems and executive support systems. Artificial intelligence. Office automation. Information systems and processing technologies. Database management systems. Development of user applications.

ENM362 Process Management (3–0 | 3 | 5 | M)
Process characteristics; process initiation; process definition. Business process management and related management tools I–II. Business process analysis. Business process management systems (software). Documentation I–II. Performance management and process performance. Process improvement: critical processes.

Process improvement: Six Sigma steps. Process improvement methods (e.g., PDCA, benchmarking, etc.). Case studies in process management applications.

ENM364 Risk Analysis and Management (3–0 | 3 | 5 | M)
Introduction to risk analysis. Risk, uncertainty, probability, and risk perception. Risk management and risk assessment. Quantitative and qualitative risk assessment techniques. Preliminary Hazard Analysis (PHA). Failure Modes and Effects Analysis (FMEA). Event Tree Analysis (ETA). Fault Tree Analysis (FTA). Bow-tie risk analysis technique. Hazard and Operability Analysis (HAZOP).

ENM366 Multi-Criteria Decision Making (3–0 | 3 | 5 | M)
Fundamental concepts in decision making. Analytic Hierarchy Process (AHP) with SuperDecisions applications. Analytic Network Process (ANP) with SuperDecisions applications. TOPSIS with Excel applications. ELECTRE with Excel applications. PROMETHEE with Visual PROMETHEE applications. VIKOR with Excel applications. Entropy method. Best–Worst Method (BWM) with Excel applications. CRITIC method with Excel applications. WASPAS method. EDAS with Excel applications. CILOS method. IDOCRIW method. SWARA. DEMATEL with Excel applications. FUCOM with Excel applications.

ENM410 Flexible Manufacturing Systems (3–0 | 3 | 5 | M)
Manufacturing operations and manufacturing models. Automation and manufacturing systems. Single-station cells. Manual assembly lines. Automated production lines. Cellular manufacturing. Flexible manufacturing systems.

ENM416 Maintenance Planning (3–0 | 3 | 5 | M)
Maintenance function and organization within an enterprise. Solution approaches for typical maintenance planning problems. Repair and maintenance. Preventive and predictive maintenance policies. Total Productive Maintenance (TPM) approach. Introduction to the "Nonstop" maintenance module of the Dinamo ERP software package.

ENM420 Energy—all in Industry (Energy Economics) (3–0 | 3 | 5 | M)
Fundamental concepts and methods in energy economics, presented under themes such as energy and quality of life; energy resources and forecasting; energy supply and demand planning; energy and the environment; new energy technologies; and sustainable development.

ENM422 Mechanical Design (3–0 | 3 | 5 | M)
Design characteristics and stages; design for fatigue. Fasteners and joining methods: screws/bolts, welding, adhesives. Gears. Journal bearings and rolling-element (ball) bearings. Shafts and axles. Couplings, clutches, and brakes. Belts and chains.

BIL475 Data Mining (3–0 | 3 | 5 | M)
Data: types, quality, preprocessing. Similarity and distance measures. Summary

statistics, visualization, and high-dimensional data analysis. Classification: decision trees, model evaluation, Bayesian classifiers, artificial neural networks, and support vector machines (SVM). Association analysis. Clustering: k-means and hierarchical clustering algorithms; cluster validation; other clustering approaches. Applications using R software.

ISL202 Human Resource Management (3–0 | 3 | 5 | M)

Overview of human resource management: fundamental concepts and historical development. Human resource planning, recruitment and selection, and onboarding/orientation. Occupational safety and employee health. Labor–management relations. Measurement and evaluation of HR functions. Outsourcing in HR. Ethical principles in HR management. International human resource management. Current developments and emerging approaches.

ENM346 Computer-Integrated Manufacturing (3–0 | 3 | 5 | M)

General definitions. CIM architecture. Numerical control in CIM. Group technology and process planning. Material handling systems. Programmable logic control. Information modeling of manufacturing systems. Flexible manufacturing systems (FMS). Numerical control and CNC machine tools (e.g., CNC milling machines), CIMLAB, and an introduction to industrial robots.

ENM431 Object-Oriented Programming (3–0 | 3 | 5 | M)

Setting up and configuring a visual programming editor. Forms and their properties. Objects. Input and message windows; dialog windows. Advanced objects. Operators, functions, loops, and arrays. Database creation. Database reporting. Database graphing/visualization operations. Database applications.

ENM454 Fuzzy Logic (3–0 | 3 | 5 | M)

Classical and fuzzy sets. Fuzzy set operations. Fuzzy arithmetic. Defuzzification. Fuzzy inference systems. MATLAB Fuzzy Logic Toolbox training and applications. Fuzzy decision making: Fuzzy AHP with Excel applications; Fuzzy TOPSIS with Excel applications; Fuzzy VIKOR with Excel applications.

ENM456 Total Quality Management (3–0 | 3 | 5 | M)

Definition of quality and core concepts of Total Quality Management. Customer satisfaction. Process management. Continuous improvement. Performance metrics. Quality Function Deployment (QFD) and applications. Supplier selection. Cost of quality. Taguchi approach. Benchmarking. Quality management systems.

ENM458 Facility Planning (3–0 | 3 | 5 | M)

Introduction to facility planning (objectives, goals, principles, scope, and basic definitions). Product, process, and schedule designs. Flow, space, and activity relationships. Personnel requirements and material handling systems. Facility layout planning procedures. Systematic Layout Planning (SLP). Layout planning models: MIP

approach and layout (construction) approaches. Discrete layout algorithms: CRAFT, MULTIPLE. Continuous layout algorithms: BLOCPLAN, LOGIC, MULTIPLE. Warehouse layout techniques. Site selection in facility planning.

ENM460 Financial Engineering (3–0 | 3 | 5 | T, M)
Business cycles. Fundamental concepts related to financial statements. Analysis of cash flows. Funds flow statements and cash flow statements, including applications. Financial ratio analysis: liquidity ratios, asset management ratios, debt management ratios, profitability ratios, and market ratios. Operating leverage, financial leverage, and total leverage. Break-even analysis. Financial forecasting models. Financial mathematics. Risk as a factor in investment management. Measuring portfolio risk; diversification in portfolio construction. Risk–return relationship; risk measurement. Modern Portfolio Theory (MPT). Capital Asset Pricing Model (CAPM). Portfolio performance measurement. Value at Risk (VaR). Capital budgeting methods: present value, internal rate of return, payback period, and profitability index. Cost of capital. Valuation of equities and bonds. Introduction to financial option theory: basic concepts and option types.

SPRING SEMESTER – OUT-OF-DEPARTMENT ELECTIVES

ENG306 Professional Ethics (3–0 | 3 | 5 | G)
Engineering profession and ethics: what engineering ethics is and why it should be studied. Responsibilities of engineers. Safety and risk; protection of public safety. Legislation related to employee protection. Engineering codes of ethics and their importance. Ethics in information technology: computer and internet ethics. Environmental ethics. Ethics in scientific research and consulting. Ethical issues concerning genetically modified organisms. International rights and ethics. Selected cases from emerging technologies.

ENG308 Entrepreneurship (3–0 | 3 | 5 | G)
Fundamental concepts and core functions of entrepreneurship. Development of entrepreneurship in Türkiye. Types of entrepreneurship. Factors influencing entrepreneurship. SMEs. Business formation and start-up processes; legal structures. Sustainability of ventures. Success stories and case study analyses.