

**ENGINEERING FACULTY / INSTITUTE
DEPARTMENT OF MANUFACTURING ENGINEERING
(NEW CURRICULUM)**

FIRST YEAR					
1. Semester					
Code	Name of the Course	T	A	C	ECTS
MATH 157	Extended Calculus I	4	2	5	7.5
PHYS 101	General Physics I	3	2	4	6.0
ENG 101	English Communication Skills I	4	0	4	3.5
MFGE 121	Introduction to Computer Aided Engineering	1	2	2	4.0
MFGE 101	Introduction to Manufacturing Engineering	2	0	2	2.0
HIST 111	Prin. of Atatürk and Hist. of Turkish. Rev. I	2	0	2	2.0
CEAC 105	General Chemistry	3	2	4	5.0
				23	30

FIRST YEAR					
2. Semester					
Code	Name of the Course	T	A	C	ECTS
MATH 158	Extended Calculus II	4	2	5	7.5
PHYS 102	General Physics II	3	2	4	6.0
MFGE 108	Computer Aided Solid Modelling	1	3	2	4.0
CMPE 102	Computer Programming	2	2	3	4.0
ENG 102	English for Academic Purposes II	4	0	3	3.5
HIST 112	Prin. Of Atatürk and Hist. of Turkish. Rev. II	2	0	2	2.0
HIST 221	History of Civilization	3	0	3	3.0
				22	30

SECOND YEAR					
3. Semester					
Code	Name of the Course	T	A	C	ECTS
ME 201	Statics	3	0	3	6.0
EE 234	Introduction of Electrical Engineering	3	1	3	5.0
MATE 207	Introduction to Materials Engineering	3	0	3	5.0
MFGE 205	Introduction to Manufacturing Processes	2	2	3	5.0
ENE 203	Thermodynamics I	3	0	3	6.0
ENG 201	English for Academic Purposes III	3	0	3	3.0
				18	30

4. Semester					
Code	Name of the Course	T	A	C	ECTS
MECE 204	Dynamics	3	1	3	6.0
ME 210	Strength of Materials	3	1	3	6.0
MFGE 202	Principles of Engineering Design	2	2	3	3.0
MATH 275	Linear Algebra	4	0	4	6.0
MATH 276	Differential Equations	4	0	4	6.0
ENG 202	English for Academic Purposes IV	3	0	3	3.0
				20	30

THIRD YEAR					
5. Semester					
Code	Name of the Course	T	A	C	ECTS
MFGE 303	Metal Forming	3	1	3	5.0
IE 305	Engineering Economy	2	0	2	5.0
MECE 303	Theory of Machines	3	1	3	6.0
MATH380	Numerical Methods for Engineers Professional Communication	3	1	3	5.0
ENG 301	English for Career Development I	3	0	3	3.0
ENE 301	Heat Transfer	3	1	3	6.0
MFGE 399	Summer Practice I			NC	6.0
				18	36
6. Semester					
Code	Name of the Course	T	A	C	ECTS
ME 316	Machine Elements	3	1	3	7.0
	General Elective	3	0	3	4.0
MFGE 312	Statistical Analysis and Instrumentation	3	1	3	5.0
MFGE 316	Casting and Powder Metallurgy	3	1	3	6.0
ENG 302	English for Professional Communication II	3	0	3	3.0
MFGE 307	Metal Cutting	3	1	3	5.0
				18	30

FOURTH YEAR					
7. Semester					
Code	Name of the Course	T	A	C	ECTS
MFGE 401	Capstone Project I	3	1	3	9.0
TURK 401	Turkish Language I	2	0	2	2.0
	Area Elective	3	0	3	5.0
	Area Elective	3	0	3	5.0
	Area Elective	3	0	3	5.0
	General Elective	3	0	3	4.0
MFGE 499	Summer Practice II			NC	6.0
				17	36
8. Semester					
Code	Name of the Course	T	A	C	ECTS
MFGE 402	Capstone Project II	1	4	3	9.0
TURK 402	Turkish Language II	2	0	2	2.0
	Area Elective	3	0	3	5.0
	Area Elective	3	0	3	5.0
	Area Elective	3	0	3	5.0
	General Elective	3	0	3	4.0
				17	30

Area Elective Courses

	AREA ELECTIVES	Theory	Lab	Credit	ECTS
1	MFGE 310 Finite Element Analysis for Manufacturing (Practical Aspects)	2	2	3	5
2	MFGE 404 Computer Integrated Manufacturing	3	1	3	5
3	MFGE 405 Rapid Prototyping	2	2	3	5
4	MFGE 406 Joining Technologies	3	0	3	5
5	MFGE 412 Introduction to Optimization	3	0	3	5
6	MFGE 418 Advanced Strength of Materials	3	0	3	5
7	MFGE 420 Project Management in Manufacturing	3	0	3	5
8	MFGE 426 Manufacturing of Automobiles	3	0	3	5
9	MFGE 432 Polymer Processing	3	0	3	5
10	MFGE 433 Residual Stresses	3	1	3	5
11	MFGE 434 Introduction to Distortion Engineering	3	1	3	5
12	MFGE 478 Production Plant Design	3	0	3	5
13	MFGE 481 Nanofabrication	3	0	3	5
14	MFGE 577 Quality Control and Metrology	2	2	3	7,5
15	ME 425 Mechanical Vibrations	3	0	3	5
16	ME 431 Failure Analysis	3	0	3	5
	ME 435 Fracture Mechanics	3	0	3	5
18	MATE 440 Corrosion and Oxidation of Metals	3	0	3	5
19	MATE 442 Welding Metallurgy and Technology	5	0	3	5
20	MATE 446 Composite Materials	3	0	3	5
21	MATE 450 Nondestructive Evaluation of Materials	3	0	3	5
22	MATE 452 Fracture of Engineering Materials and Failure Analysis	3	0	3	5
23	MATE 460 Biomaterials	3	0	3	5
24	MATE 462 Nanomaterials	3	0	3	5
25	MATE 464 Surface Processing of Materials	3	0	3	5
26	MATE 466 Polymer Science and Technology	3	0	3	5
27	MECE 431 Advanced Measurement Techniques for Physical Quantities.	2	2	3	4
28	MECE 441 Artificial Intelligence	3	0	3	4
29	IE 416 Expert Systems	3	0	3	5
30	AE 411 Automotive Manufacturing Processes using Lightweight Metals	1	4	3	5

Course Contents

MFGE 101 - Fundamentals of Engineering (2-0)2

Introduction, Historical Development of Science/Engineering and Industry, Definitions and Methodologies of Engineering and Science, Functions of Engineers, Roles and Types of Engineers, Engineering, Society and Environment, Engineering and Mathematics, Safety in Engineering, Design and Applications in Engineering, Research and Technology in Engineering, Engineering Education and Communications, Engineering Ethics, Engineering and Computers, Visits to Laboratories and/or Factories

MFGE 105 - Computer Aided Engineering Drawing I (1-3)2

Principles of computers and computer usage, principles of technical drawing, technical sketching and shape description, multiview and sectional projections, 2D drawings using AutoCAD, an introduction to geometrical and dimensioning tolerancing and surface marks

MFGE 205 - Manufacturing Processes (2-2)3

Mechanical properties of materials, metal casting, mechanical deformation processes (bulk and sheet forming), machining and joining operations, polymer processing, powder metallurgy

MFGE 202 - Principles of Engineering Design (2-2)3

Auxiliary part design and surface design. Assembly design and bill of materials. Screw threads, threaded fasteners. Keys, springs, locking devices. Gears and cams. Drafting, dimensioning and tolerances. Introduction to linear finite elements analysis in Catia. Center of gravity and moment of inertia calculations, simple solid mechanics problems.

MFGE 121 - Introduction to Computer Aided Engineering (1-2)2

Introduction to Computers and Computing systems, MATLAB® environment, Basic input- output and arithmetic in MATLAB®, The m-files, Symbolic expressions, variable precision and exact arithmetic, Managing variables, Assignments, Vectors and Matrices, Polynomials, Rational functions, Trigonometric functions and user defined functions, Functions and procedures in MATLAB®, Calculus with MATLAB® – differentiation, integration, limits, sums and products, Taylor Series, Graphics: Two dimensional plots, More into graphics: Three dimensional plots, Special functions: Logarithmic functions, hyperbolic functions, exponential functions, inverse functions, MATLAB® Programming – Branching, MATLAB® Programming – Loops and Other programming commands, MATLAB® Programming – Subfunctions, commands for parsing input and output, Debugging.

MFGE 303 - Theory of Manufacturing Technology I (Metal Forming) (3-1)3

Plasticity theory and metal forming. Metallurgical considerations. Cold, warm and hot forming. Extrusion, forging, wire drawing and deep drawing.

MFGE 307 - Theory of Manufacturing Technology II (Metal Cutting) (3-1)3

Machine tools and machining operations, mechanics of metal cutting, temperatures in metal cutting, tool life and tool wear, economics of metal cutting operations, tool life for minimum cost, minimum production time, optimum conditions, machining at maximum efficiency, facing operations and operations with interrupted cuts, cutting fluids, surface roughness, chip control, machine tool vibrations

MFGE 310 - Finite Element Analysis for Manufacturing (Practical Aspects) (2-2)3

Direct Approach, Plane strain, plane stress and axisymmetric problems, principal of virtual work based formulation for 2D problems, FEM for heat transfer problems.

MFGE 312 - Statistical Analysis and Instrumentation (3-1)3

Basic concepts, Analysis of Experimental Data, Working principles of Basic Electrical Measurements and Sensing devices

MFGE 316 - Theory of Manufacturing Technology III (Casting and Powder Metallurgy) (3-1)3

Fundamentals of casting, Solidification of pure metals, solidification of alloys, riser and runner

MFGE 399 - Summer Practice I (0-0)0
Introduction, Manufacturing processes, practice

MFGE 401 - Capstone Project I: Product and Process Design (3-1)3
Review of engineering design concepts. Phases of engineering design, feasibility study, preliminary design, and detail design. Design for X. Presentation tools for engineering design. Types of engineering design. Modeling of engineering design. Case Studies. Open ended capstone term projects will be assigned to the teams of students to practice engineering design.

MFGE 402 - Capstone II: Manufacturing System Design (1-4)3
Review of engineering design concepts. Phases of engineering design, feasibility study, preliminary design, and detail design. Design for X. Presentation tools for engineering design. Types of engineering design. Modeling of engineering design. Case Studies. Open ended capstone term projects will be assigned to the teams of students to practice engineering design.

MFGE 499 - Summer Practice II (0-0)0
Introduction, Manufacturing processes, practice.

MFGE 404 - Computer Integrated Manufacturing (3-1)3
Introduction, Computer Aided Design (CAD) Systems, Computer Aided Graphical Modelling, CAD Data Bases, Computer Aided Manufacturing (CAM) Systems, Computer Aided Process Planning (CAPP) Systems, Robotic Systems, Group Technology and Cellular Manufacturing Systems, Automated Material Handling Systems, Automated Inspection Systems, Flexible Manufacturing Systems(FMS)

MFGE 405 - Rapid Prototyping (2-2)3
Overview of rapid prototyping and automated fabrication technologies, injection molding, rapid prototyping technologies, the underlying material science, generating CAD models suitable for automated fabrication, secondary processing

MFGE 406 - Joining Technologies (3-0)3
Stress analysis, static and fatigue failure criteria for joined structures. Design methods for mechanical fastening, welding and adhesive bonding. Manufacturing of joints (i.e. installation of fasteners, application on adhesive on substrates). Maintenance of joints (e.g. corrosion protection, inspection, etc.)

MFGE 412 - Introduction to Optimization (3-0)3
Introduction to optimization, Graphical optimization, Least squares regression, Linear and non-linear programming, Numerical techniques, Unconstrained and constrained optimization, Global optimization (genetic algorithm), Applications.

MFGE 418 - Advanced Strength of Materials (3-0)3
Analysis of Stress and Strain. Principle stresses and strains. Generalized Hooke's law. Strain energy. Yield and Failure criteria. Plane strain and plane stress problems, Airy stress function. Unsymmetrical bending of beams and shear center. Torsion of noncircular cross sections. Prandtl's membrane analogy. Energy methods. Plastic deformation and residual stresses analyses for basic structural members.

MFGE 420 - Project Management in Manufacturing Engineering (3-0)3
This course improves an ability to formulate problems, modeling, selection of solution algorithm for models and also computer assisted model solving and test. Detailed problem solutions for companies could be used and explained in class for providing the aim of understanding the application methods for project management.

MFGE 426 - Manufacturing of Automobiles (3-0)3
Manufacturing techniques used in Automobile industry, automobile parts and manufacturing methods – cast parts, machined parts, parts produced by metal forming, sheet deformation processes, polymers and composite parts -, assembly, welded parts and welding techniques, production lines, design of automobile parts considering production.

MFGE 432 - Polymer Processing (3-0)3

Introduction to polymer processing; the nature of plastics and rubbers; morphology and structuring of polymers; additives; surface properties; thermodynamic properties of polymers; melting and mixing; die forming, polymer extrusion, molding processes, manufacture of tires and other rubber products, composite manufacturing, pultrusion

MFGE 433 - Residual Stresses in Manufacturing (3-1)3

Residual Stresses, Measurement Techniques, Sources of Residual Stresses, Development of Residual Stresses based on the Manufacturing Method, Effect of Residual Stresses on Subsequent Manufacturing Processes, Effect of Residual Stresses on Service Performance and Failure.

MFGE 434 - Distortion Engineering (3-1)3

Distortion, Distortion Potential, Distortion Potential Carriers, Compensation Potential, Production step Based solutions, Intelligent Process Chain Design, Predictive Methods, Use of In-situ Measurement Techniques and Adaptive Process Control

MFGE 478 - Production Plant Design (3-0)3

Introduction, Fundamentals of design and CAD, Manufacturing systems (CAD/CAM, FMS and CIM), Market survey and plant location, Plant Layout, Process Analysis, Quantity and quality planning and controlling for production, Process and machine selection, Materials handling, Storage types, Safety regulations, Maintenance, Environmental factors, Research and Development

MFGE 481 – Nanofabrication (3-0)3

Fabrication of metallic nanomaterials, manufacturing of carbon based nanostructures, Nanostructured Systems from Low-Dimensional Building Blocks, Characterization techniques and manufacturing methods, Proximity effect