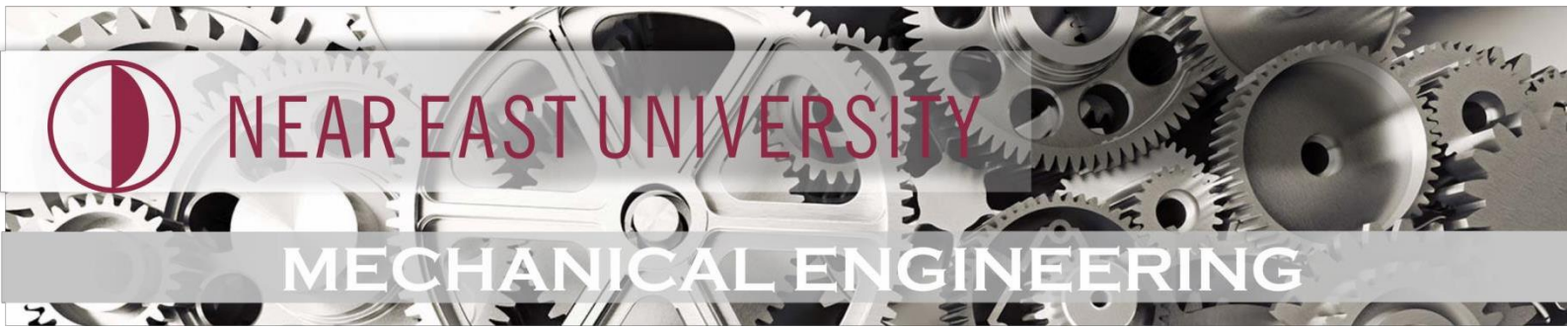

General information

To support and lead the nation's requirements and technological developments , to be able to conduct international projects and to have an authority in research areas. To perform research studies and to educate engineers equipped with technical "know-how", creative thinking and being able to try and research new technologies to achieve required goal. The vision of the department is to have respect and authority in engineering activities and to gain acceptance through research projects, support to the nation and delivering high quality engineers.

The aim of the mechanical engineering department is to prepare engineering candidates for various branches of industry with an improved self-confidence and individual initiative. Students are educated to have scientific systematic approach in solving engineering problems, sound engineering base, life-long learning habits and research abilities.

Profesional accreditation:

ME is accredited by **European Accreditation Agency (ASIIN).**

Program Objective:

As individuals and members of a competitive team, the graduates of the Department of Mechanical Engineering will have:

- A solid mathematical and scientific background necessary to comprehend the fundamentals of Mechanical Engineering.
- A strong foundation in engineering areas relevant to current industry needs to allow them to successfully compete for demanding and high quality.
- An ability to apply design procedures as required by the discipline which will allow them to produce resourceful and innovative engineering.
- An ability to communicate effectively and to act with social, ethical, and professional responsibility to fulfil their commitment inside and outside the engineering.
- An ability to use computers as a tool for analysis, design, simulation, and strong laboratory skills that will allow them to design and conduct experiments with systems and instruments of various complexity in the field.
- An understanding of a life-long learning and critical thinking required for entrepreneurship, competitiveness, leadership, and adaptation.
- An understanding of social, business, industrial, and human aspects as a complement to their engineering abilities.

Learning outcomes of the Master's degree program:

1. An ability to understand and apply extensive advanced knowledge of mathematic-scientific and engineering principles
2. An ability to analyse and solve problems scientifically
3. An ability to apply innovative computational methods in mechanical engineering to problem-solving
4. An ability to plan and carry out analytic, model and experimental investigations.
5. An ability to design an efficient research methodology and carry out advanced level of research on specific mechanical engineering topics
6. An ability to carry out team-work activities with other specialized mechanical engineers or participating in team-work activities of multi-disciplinary nature for solution of the targeted problem
7. An ability to correlate advanced level mechanical engineering concepts and theories with each other, as well as with the basic level engineering background received in BSc. Degree education
8. An Ability to use advanced level engineering theories on the analysis and/or the design of specified mechanical engineering problems /projects.

Graduation Requirements:
Final examinations of graduate courses will be assessed over 100 (one hundred) full points by the faculty member(s) carrying out the exam. In order to pass the final exam, master's students must earn a minimum score of 70 (seventy out of 100 (one hundred) points.Cumulative grade point average must be 80 (eighty) over 100 (one hundred) or 3.00 (three) over 4.00 (four) to earn a master's or doctoral degree.

Master's Program With Thesis:

The aim of the master's program with thesis is to enable students to acquire the ability to conduct scientific research leading to the acquisition, evaluation and interpretation of knowledge. A master's program with thesis is comprised of a minimum of seven courses, not being less than 21 credits, one seminar course, other educational activities and thesis study. The seminar course and thesis study are compulsory. Students may also take courses from other institutions of higher education upon the recommendation of the Department Chairperson and approval of the Graduate School Administrative Board.

Master's Degree Diploma:

A student who has passed the thesis examination, completed all other requirements, and submitted at least four bound copies of the thesis to the Graduate School within one month after taking the thesis examination will be conferred the Master's Degree Diploma on condition that the thesis meets the format requirements. The Master's Degree Diploma will bear the official name of the program completed and the title Master of Science awarded .

MODULES

Core Modules:

ME 500 Master's Thesis
The students are required to conduct research studies under supervision on a topic and are asked to prepare a thesis report and presentation.

ME 599 Master's Seminar
Students are taught how to prepare an effective seminar and are asked to prepare and present a seminar on a given topic.

ME 501 Applied Mathematics for Engineers
Review of Vector Algebra, Complex Numbers, Laplace Transforms and Fourier Series. Review of Ordinary Differential Equations. Variations of Parameters and Cauchy-Euler Differential Equations. Beta and Gamma Functions. System of Linear Diffrerential Equations. Partial Differential Equations and Probability.

ME 502 Advanced Numerical Methods
Nonlinear algebraic equations, sets of linear algebraic equations, eigenvalue problems, interpolation, curve fitting, ordinary differential equations, and partial differential equations, solution of partial differential equations of the parabolic, elliptic and hyperbolic type. Applications include fluid mechanics, gas dynamics, heat and mass transfer, thermodynamics, vibrations, automatic control systems, kinematics, and design.

ME 541 Production Systems Engineering
Experimental and Analytical Approaches in Machining.Desing of injection molds and plastic products. Programming techniques in manufacturing and design. System analysis, Applied CAD/CAM, Applied finite element analysis. Finite element method use in cutting tools. Numerical modelling in machine design, Powder Injection molding. CNC Systems and Industrial applications, Design of ındustrial mechanisms.

ME 555 Advanced Machine Design
The course provides a wide conceptual approach to analysis and design of mechanical systems. Fundamental design principles are considered and criticized. Material sellection, force, stress and failure analysis of mechanical systems are discused. Students are supposed to design a mechanical system for a given need.

ME 565 Advanced Heat Transfer
In this course, the principles of heat transfer as applied to the analysis of engineering oriented problems is presented. The concepts of thermodynamic energy balances are used in various analytical developments and familiarity with fluid mechanics is certainly essential for the discussion of convective heat transfer section. Presentation of the material follows classical line of separate discussion for conduction, convection, and radiation and with applications where heat transfer in two or more modes might be significant.

Elective Modules: *3 elective courses to be chosen to complete the program

ME 503 Scientific Research Methods (3 credits)
The course defines the understanding of science and engineering and describes the links between the interrelated technical subjects. Further, it considers the methods of scientific research and focuses on the five methods most widely used for natural sciences and engineering, giving much emphasis on experimental and field studies research methods. It also stresses the importance of integrated research methods. It stresses the important aspects of writing research proposal, presenting and report (thesis) writing. Finally it provides some information on research ethics and on controversies in research.

ME 511 Advanced Mechanical Behavior of Materials (3 credits)
Yielding and fracture under combined stress, Fracture of cracked members, Stress based fatigue for materials and notched members, Crack growth, Plastic deformation and models, plastic stress-strain analysis. Strain based approach to fatigue. Time dependent behavior

ME 515 Introduction to Implant Materials (3 credits)
Relationship between materials and medical science. Classification of implant materials in Orthopedy and Dentistry. Mechanical, Phyisical and Chemical properties of implant materials, biocompatibility, degradation of implant materials in biological environment, new products and standards.

ME 526 Introduction to Finite Element Method(3 credits)
Analysis of stress and strain. Constitutive equations. Plane problems of elasticity. The finite element concept. One-and two-dimensional finite element formulation techniques. Transformations, assembly and solution techniques. Introduction to three dimensional finite elements. Project assignments of one and two dimensional problems

ME 531 Advanced Fluid Mechanics (3 credits)
Governing Equations, Basic Conservation Laws, Flow Kinematics, Special Foems of the Governing Equations, Ideal-Fluid Flow:Two-dimensional Potential Flows, Viscous Flows of Incompressible Fluids: Exact Solutions.

ME 532 Boundary Layer Theory (3 credits)
Some Features of Viscous Flow, Fundamentals of Boundary-Layer Theory, Field Equations for Flows of Newtonian Fluids, Laminar Boundary Layer: Boundary layer Equations in Plane Flow, Exact Solutions of the Boundary Layer Equations for Plane flows.Unsteady Boundary Layers. Laminar-Turbulent Transition, Turbulent Boundary Layer.

ME 533 Turbulent Flow(3 credits)
Stability Theory and Transition, Reynolds equation, Physical Structure of Turbulent Boundary Layer, Turbulent Pipe and Channel Flow, Analysis of Flat Plate, Integral Analysis, Jets, Wakes, Free-Shear layers, Turbulence Modelling, Isotropic Turbulence, Energy Spectra, Correlations.

ME 534 Computational Fluid Flow and Heat Transfer(3 credits)
Differential Equations, Types of Differential Equations, Boundary and Initial Conditions, Momentum, Energy, ans Species, General Form of the Conservation Equation; Review of Approximate Methods, Finite Difference, Weighted Residual, Spectral Method, Finite Element, Control Volume, Finite Analytical Method, Control Volume Formulation; Steady and Unsteady Diffusion Equation, Time Discretization Techniques, Explicit, Crank-Nicolson, Implicit Schemes; Solution of Algebraic Equations; Convection-Diffusion Equation, Upwind, Central and Quadratic Schemes, False Diffusion; Vorticity and Permittive Approach, Staggered Grid Concept, SIMPLE and Other Version of SIMPLE (SIMPLER) Algorithm; Applications, Examples of Heat Transfer, Laminar, Turbulent Flow.

ME 541 Production Systems Engineering
Experimental and Analytical Approaches in Machining.Desing of injection molds and plastic products. Programming techniques in manufacturing and design. System analysis, Applied CAD/CAM, Applied finite element analysis. Finite element method use in cutting tools. Numerical modelling in machine design, Powder Injection molding. CNC Systems and Industrial applications, Design of ındustrial mechanisms.

ME 554 Heat Treatment of Metals(3 credits)
Phase transformations in solids. Modification of materials properties via Heat treatment↔Structure↔Property route. Spectrum of heat treatment, standards and equipment utilized. Fe-C phase diagram. Austenite transformation, TTT diagram and CCT curves. Hardenability, quenching and tempering of steel. Case hardening. Precipitation hardening. Heat treatment of non-ferrous metals.

ME 561 Advanced Engineering Thermodynamics (3 credits)
1st and 2nd Laws of Thermodynamics, Availability and Chemically Reacting Systems.

ME 565 Advanced Heat Transfer (3 credits)
In this course, the principles of heat transfer as applied to the analysis of engineering oriented problems is presented. The concepts of thermodynamic energy balances are used in various analytical developments and familiarity with fluid mechanics is certainly essential for the discussion of convective heat transfer section. Presentation of the material follows classical line of separate discussion for conduction, convection, and radiation and with applications where heat transfer in two or more modes might be significant.

ME 567 Advanced Conduction (3 credits)
Derivation of heat conduction equation in rectangular, cylindrical and spherical coordinate systems, and solution methods of this differential equation for steady and transient cases under various boundary conditions.

ME 568 Advanced Convection (3 credits)
Derivation of mass, momentum and energy conservation equations in rectangular and cylindrical coordinate systems. Boundary layer theory, solution of conservation equations and application in various problems.

ME 571 Mechanical Behavior of Composite Materials (3 credits)
Introduction to composite materials, Review of linear elasticity theory, Generalized Hooke's Law for anisotropic elastic materials, Macro- and micro- mechanical behavior of a lamina, Macromechanical behavior of a laminate, Bending, buckling and vibration of laminated plates.

ME 573 Fracture Mechanics (3 credits)
Analysis concepts for determining stress intensity factors for various types of cracks. Advanced experimental methods for evaluation of materials or structures for fracture toughness, analysis of moving cracks and the statistical analysis of fracture strength are topics covered during this course. Finally, illustrative fracture control plans are treated to show the engineering applications of fracture mechanics.

ME 574 Theory of Elasticity (3 credits)
Definitions of stress and strain, stress-strain relations and tensors. Equilibrium equations, displacements and small strains, compatibility, and strain energy; formulation of the governing equations and the appropriate boundary conditions in linear elasticity, and uniqueness of the solutions; two-dimensional theory; stress functions; solutions in Cartesian and polar coordinates; and Fourier series. Elastic contact. Thick walled cylinders and disks. Beams on elastic foundation.

ME 575 Materials Failure Investigation (3 credits)
Relationship between the structure, charateristics, performance and failure in engineering materials. Material defects during production and in use. Crack propagation, fatigue, creep, radiation failure, wear, oxidation and corrosion. Examples. Failure prevention and measures.

ME 576 Semi-Solid Forming(3 credits)
Relationship between the structure, charateristics and process in engineering materials. Core knowledge on materials which are used in high performance products and industrial processes, microstructure and characteristics of semi-solids, alloys with wide freezing range, squeeze casting and semi-solid production technigues. Quality of products.

ME 577 Material Selections(3 credits)
A brief review of engineering materials. Details of Ashby materials selection charts. Materials selection procedure. Problems with multiple objectives and constraints. Influence of shape. Case studies. Student presentations.

ME 581 Advanced Stress Analysis (3 credits)
Studies of stresses and strains in three-dimensional problems, failure theories and yield criteria, stress function approach to two-dimensional problems, bending of non homogeneous asymmetric curved beams, torsion of bars with noncircular cross sections, energy methods, elastic stability, introduction to plates.

ME 582 Advanced Mechanics of Solids (3 credits)
Continuum mechanics of solids and its application to the mechanical response of machine and structural elements, elasticity, plasticity and fracture criteria, elastic stress and analysis in torsion, plane stress and plane strain, stress concentrations, fracture mechanics, principle of virtual work and variational theorems, finite element method theorems of plastic limit analysis.

ME 591 Non-Traditional Production Methods(3 credits)
Introduction to non-traditional production methods and their classifications, mechanical energy, electromechanical chip production, thermal energy and chemical machining methods.