

**ALANYA ALAADDİN KEYKUBAT ÜNİVERSİTESİ**  
**LİSANSÜSTÜ EĞİTİM ENSTİTÜSÜ**  
**MAKİNE MÜHENDİSLİĞİ ANABİLİM DALI**  
**MAKİNE MÜHENDİSLİĞİ TEZLİ YÜKSEK LİSANS (%100 İNGİLİZCE) PROGRAMI**  
**DERS İÇERİKLERİ**

**I.YIL – I. YARIYIL**

DERS KODU	DERSİN ADI	DÖNEM	DERS SAATİ			AKTS	İÇERİK
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LEE 571	MASTER SPECIAL STUDIES	FALL	8	0	0	8	It is a theoretical course that will be applied to transfer the knowledge, skills and experiences of the advisor in the scientific field in which the advisor is working, to give students the ability to follow and evaluate the scientific ethics and study discipline, to follow and evaluate the current literature, to create and conduct the scientific foundations of thesis studies.
LEE 581	MASTER ADVISING	FALL	0	1	0	1	It is an application course that the thesis advisor will open with the master's field of specialization and the thesis study. Conceptual and practical studies related to the thesis topic.
MEC 501	SCIENTIFIC RESEARCH METHODS AND ETHICS	FALL	3	0	0	6	Basic qualities of researcher, responsibilities of researcher. Scientific methods, fundamentals of a research, scientific research and types, basic research, applied research, literature survey. Reference search, selection of research problem, selection of topic, evaluation of research results, writing of scientific findings, citation techniques. Main chapters in scientific papers, thesis preparation, chapters of a thesis, writing steps of a thesis, presentation preparation. Ethic in scientific research, unethical situations.
MEC 511	ADVANCED MATHEMATICS FOR ENGINEERS	FALL	3	0	0	5	First, second, and higher-order differential equations, method of undetermined coefficients, method of variation of parameters, series solutions of differential equations (SSDEs). Laplace transforms and applications, matrices, vectors, determinants, linear systems of equations, gauss elimination, eigenvalues, eigenvectors. Fourier analysis, series, integrals, and transforms. Partial differential equations.
MEC 513	FINITE ELEMENT METHOD	FALL	3	0	0	5	Finite element formulation, modeling and solution methods to solve engineering problems numerically. Finite element modeling, coordinates and shape functions. The potential energy approach, assembly of the global stiffness matrix (K) and load vector, properties of matrix k. The finite element equations and treatment of boundary conditions. Quadratic shape functions. Trusses, plane trusses, three- dimensional trusses. Two-dimensional problems using constant strain triangles, finite element modeling, constant strain triangles. Problem modeling and boundary conditions.
MEC 521	ADVANCED STRENGTH OF MATERIALS	FALL	3	0	0	5	Advanced and applied knowledge in the area of material behavior and their mechanics and their applications in structural engineering. Analysis of stress, analysis of strain and problems in elasticity. Simple beams subjected to pure bending, engineering materials, and mechanical properties of materials. Bending of beams, torsion of noncircular/prismatic shafts, thick walled cylinders and rotating disks. Beams on elastic foundations, applications of the energy method. Stability of columns, plastic behavior of materials.
MEC 523	MECHANICS OF COMPOSITE MATERIALS	FALL	3	0	0	5	Types of composite materials, matrix materials, thermosets, thermoplastics, fiber materials. Rule of mixtures, constitutive relation for anisotropic materials. Laminates, constitutive relations, transformation equations. Strength and failure criteria, classical theory of laminated plates, governing relations, higher order theories, energy methods. Cylindrical bending and vibration of laminated plates.
MEC 525	FATIGUE	FALL	3	0	0	5	Design and development of equipment subjected to repeated loadings and who must make decisions concerning the fatigue resistance of a structure, machine or component. Characteristic features of fatigue failures, total life approach to design, cyclic stress controlled fatigue stress life approach. Effect of mean stress on fatigue life, stress fluctuations, cumulative damage and safe life design. Stress concentration at notches, fatigue strength of notched specimens, Neuber's method. Stress intensity factors of cracks and their application, fatigue crack propagation.
MEC 527	PLATES AND SHELLS	FALL	3	0	0	5	Equations of elasticity. Kirchoff plate theory. Mindlin plate theory. Kirchoff-Love hypothesis for shells. Reisner theory. Buckling of plates and shells.
MEC 531	ADVANCED DYNAMICS	FALL	3	0	0	5	Review of particle dynamics. D'Alembert's principle. Lagrange's equations. Hamilton's equations. Rigid body dynamics. The Gibbs–Appell equation. The Boltzmann–Hamel equation. Rotor dynamics.
MEC 533	STATE SPACE CONTROL THEORY	FALL	3	0	0	5	Linearization of nonlinear systems. State equation solution. Laplace domain representation. State-space realization. Coordinate transformations and controllability. Observability and observer canonical form. Stability analysis. Design of linear state feedback control laws.

MEC 535	INTRODUCTION TO ACOUSTICS	FALL	3	0	0	5	Descriptions of sound. Waves in fluids and solids. Structural mobility. Acoustic impedance. Horns. Helmholtz resonator. Vibrational energy and power. Sound radiation by vibrating structures. Transmission of sound through partitions and fluid-structure coupling.
MEC 541	PRINCIPLES OF CAD AND CAM	FALL	3	0	0	5	General design principles, statement of the problem, analysis of the problem, alternative searching, decision making. Use of computers in the evaluation computer graphics, computer simulation techniques. Project involving CAD/CAM applications.
MEC 543	MACHINE TOOL DESIGN	FALL	3	0	0	5	Basic criteria in the design of metal removing machine tools, the design criteria of the main components of machine tools. Design of special mass production machine tools, testing procedures of machine tools. Model and similarity studies in machine tools.
MEC 551	CONDUCTION HEAT TRANSFER	FALL	3	0	0	5	1-D and 2-D steady heat conduction. Steady and unsteady heat conduction involving various boundary conditions. Transient conduction, lumped capacitance method. Methods of formulation. Analytical and numerical solutions.
MEC 553	ADVANCED THERMODYNAMICS	FALL	3	0	0	5	The first and second laws of thermodynamics. Thermodynamic properties. Exergy concept and application to energy conversion systems. Chemical reactions and chemical exergy. Thermodynamic property relations. Gas mixtures. Air-conditioning.
MEC 555	ENERGY EFFICIENCY AND MANAGEMENT	FALL	3	0	0	5	Fossil fuel systems. Renewable energy systems. Energy management and audit. Billing rate structures. Cogeneration. Thermal insulation. Waste heat recovery. Boilers and steam systems. Building energy consumption. Energy efficiency in lighting, motors, and refrigeration systems. Economic and environmental analysis.
MEC 561	ADVANCED FLUID MECHANICS	FALL	3	0	0	5	Flow kinematics. Classification of fluid motion. Conservation equations of viscous flows. Vorticity transport equation. Low-Reynolds number flows. Exact solution of viscous flow problems, laminar boundary layers, similarity solutions. Momentum Integral formulation. Boundary layer separation, laminar jets, and free shear layers. Introduction to flow instability and turbulence.
MEC 563	TURBOMACHINERY	FALL	3	0	0	5	Review of fluid mechanics, description of turbomachinery. Energy and momentum relations through an arbitrary turbomachine. Operational characteristics of turbomachines, dimensional analysis and similitude. Design limitations, axial flow turbomachines, radial and mixed flow turbomachines. Hydraulic turbines and pumps.

### I.YIL – II. YARIYIL

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LEE 572	MASTER SPECIAL STUDIES	SPRING	8	0	0	8	It is a theoretical course that will be applied to transfer the knowledge, skills and experiences of the advisor in the scientific field in which the advisor is working, to give students the ability to follow and evaluate the scientific ethics and study discipline, to follow and evaluate the current literature, to create and conduct the scientific foundations of thesis studies.
LEE 582	MASTER ADVISING	SPRING	0	1	0	1	It is an application course that the thesis advisor will open with the master's field of specialization and the thesis study. Conceptual and practical studies related to the thesis topic.
MEC 502	MASTER SEMINAR	SPRING	0	2	0	6	Seminars offered by faculty, guest speakers and graduate students designed to widen students' perspectives on specific topics of interest and to expand their range of scientific research techniques and publication ethics. M.Sc. student gives a seminar about the thesis work to a jury including the thesis supervisor. The seminar course is taken in the fourth semester of study at the latest. Evaluation is based on the seminar performance.
MEC 512	NUMERICAL METHODS IN ENGINEERING	SPRING	3	0	0	5	Ordinary differential equations. Euler, Runge-Kutta, multi-step, predictor-corrector methods. Boundary value problems. Matrix and shooting methods. Partial differential equations. Finite difference, Crank-Nicholson, Gauss-Seidel methods.
MEC 522	THEORY OF ELASTICITY	SPRING	3	0	0	5	Cartesian tensor notation. Analysis of strain, components and compatibility of strain. Analysis of stress, definitions and components of stress, equations of equilibrium. Constitutive equations, generalized Hook's law, governing equations of elasticity. Plane strain and plane stress, problems some examples of 2-D problems of elasticity. Energy principles. Sample problems of applied elasticity.
MEC 524	COMPUTATIONAL MECHANICS OF COMPOSITE MATERIALS	SPRING	3	0	0	5	Static and transient analysis of structures made of composite materials under various loading conditions. Introduction to finite element analysis, elasticity and strength of laminates. Modeling of laminate composites and sandwich composites, simulation of composite structures subjected to deformation, buckling, vibration, fracture, and impact. Post processing of the composites in terms of failure theories.

MEC 526	FATIGUE AND FAILURE OF COMPOSITE MATERIALS	SPRING	3	0	0	5	Structural behavior and failure characteristics of undamaged and damaged composite materials. Failure of unidirectional fiber/matrix composites, failure of Angle-ply laminates, through lamina and interlaminar (delamination) cracking. Impact and cracking of unidirectional composites. Characterization of the mechanical properties of face sheet and core materials. Fracture mechanics, analysis of face/core debonds. Crack propagation under fatigue failure.
MEC 532	ADVANCED VIBRATIONS	SPRING	3	0	0	5	Review of SDOF systems. Free vibration of MDOF systems. Forced vibration of MDOF systems. Determination of eigenvalues and eigenvectors. Standard eigenvalue problem. Continuous systems. Vibration measurement and applications. Vibration control. Finite element method.
MEC 534	VEHICLE NOISE AND VIBRATION	SPRING	3	0	0	5	Vehicle systems and components. Source-path-receiver approach. Random vibrations. Airborne and structure borne sound. Deterministic element-based methods. Modal analysis. Engine vibrations. Transfer path analysis. Vehicle interior noise. Vibration attenuation.
MEC 542	METAL CUTTING	SPRING	3	0	0	5	Machine tools and machining operations. Mechanics of metal cutting. Temperatures in metal cutting. Tool life and tool wear. Cutting fluids and surface roughness. Economics of metal cutting operations. Nomenclature of metal cutting. Chip control, machine tool vibration. Grinding. Manufacturing systems and automation. Design for machining.
MEC 544	DEFORMATION OF ENGINEERING MATERIALS	SPRING	3	0	0	5	Fundamental of the mechanical behavior of materials. Elements of dislocation theory. Plastic deformation of crystalline materials. The relationship between microstructure and mechanical behavior at ambient and elevated temperatures.
MEC 552	CONVECTIVE HEAT TRANSFER	SPRING	3	0	0	5	Basic equations of fluid flow. Differential and integral equations of the boundary layer. Forced convection in internal and external laminar flows. Momentum-heat transfer analogies for turbulent flow. Natural convection. Turbulent convection in terms of molecular and eddy diffusivities.
MEC 554	FUEL CELLS AND HYDROGEN SYSTEMS	SPRING	3	0	0	5	Basic concepts of fuel cells and fuel cell stacks. Design of various types of fuel cells such as phosphoric acid, alkaline, proton exchange membrane, molten carbonate, solid oxide and direct methanol fuel cells. Technical aspects of fuel cells with respect to thermodynamics, transport phenomena and electrochemistry.
MEC 556	CYCLE EXERGY ANALYSIS	SPRING	3	0	0	5	Energy and exergy concepts, exergy destruction and exergetic efficiency. Methods of exergy analysis and exergy balance. Energy and exergy analysis of steam power plants, gas turbines, combined cycles, refrigeration systems, and gas liquefaction systems. Parametric analysis and optimization of cycles. Applications to actual systems and case studies.
MEC 562	GAS DYNAMICS	SPRING	3	0	0	5	Basic equations of compressible flow. Wave propagation in compressible media. One dimensional compressible flow. Equations of motion for multidimensional flow. Methods for solution. Oblique shock. Introduction to hypersonic flow. Introduction to rarefied gas dynamics.
MEC 564	COMPUTATIONAL FLUID DYNAMICS	SPRING	3	0	0	5	The mathematical models for fluid flow simulations at various levels of approximation. Basic equations of fluid dynamics, mathematical nature of the flow equations and their boundary conditions. Basic discretization techniques, the finite difference method, the finite element method and the finite volume method. The analysis of numerical schemes, the resolution of discretized equations. Applications of CFD to incompressible fluid flow problems.

## II.YIL – I. YARIYIL

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LEE 573	MASTER SPECIAL STUDIES	FALL	8	0	0	8	It is a theoretical course that will be applied to transfer the knowledge, skills and experiences of the advisor in the scientific field in which the advisor is working, to give students the ability to follow and evaluate the scientific ethics and study discipline, to follow and evaluate the current literature, to create and conduct the scientific foundations of thesis studies.
LEE 583	MASTER ADVISING	FALL	0	1	0	1	It is an application course that the thesis advisor will open with the master's field of specialization and the thesis study. Conceptual and practical studies related to the thesis topic.
LEE 591	MASTER THESIS	FALL	0	0	0	21	Discussion and interpretation of the results of the research and studies conducted by graduate students under the supervision of a faculty member.

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LEE 574	MASTER SPECIAL STUDIES	SPRING	8	0	0	8	It is a theoretical course that will be applied to transfer the knowledge, skills and experiences of the advisor in the scientific field in which the advisor is working, to give students the ability to follow and evaluate the scientific ethics and study discipline, to follow and evaluate the current literature, to create and conduct the scientific foundations of thesis studies.
LEE 584	MASTER ADVISING	SPRING	0	1	0	1	It is an application course that the thesis advisor will open together with the master's specialization and thesis work.
LEE 592	MASTER THESIS	SPRING	0	0	0	21	Discussion and interpretation of the results of the research and studies conducted by graduate students under the supervision of a faculty member.