DOKUZ EYLUL UNIVERSITY
ENGINEERING FACULTY
DEPARTMENT OF MECHANICAL ENGINEERING

FIRST SEMESTER

FİZ 1011 PHYSICS I (3+2)
Physics and measurement, vectors, motion in one dimension, motion in two dimensions. The laws of motion, circular motion and other applications of Newton's laws, work and energy, potential energy and conservation of energy, linear momentum and collisions, rotation of rigid body about a fixed axis, rolling motion, angular momentum and torque. Static equilibrium and elasticity, oscillatory motion, the law of universal gravitation, fluid mechanics.

KİM 1013 CHEMISTRY (3+2)
Matter and measurement, atoms, molecules and ions, stoichiometry, calculations with chemical formulas and equations, aqueous reactions and solution stoichiometry, thermochemistry, electronic structure of atoms, periodic properties of the elements, basic concepts of chemical bonding, molecular geometry and bonding theories, gases, intermoleculer forces, liquids and solids, properties of solutions, chemical kinetics, chemical equilibrium, acid-base equilibria.

MAK 1001 INTRODUCTION TO MECHANICAL ENGINEERING (2+0)
Informations about the basic concepts of the mechanical engineering are given. Workgroups are created and presentations on the selected topics are prepeared.

MEE 1003 TECHNICAL ENGLISH I (3+0)
These subjects are covered in English. The engineering profession. Machines and work. The basic machines. Machine components. Friction. Steam engines. The internal combustion engine. Gas turbines and other types of engines. Industrial engineering and automation.

MAK 1005 TECHNICAL DRAWING I (4+0)
Basic concepts: norms, drawing tools, basic geometric drawings. Types of projection. Sectioning and perspective drawings, drawing comprehension, complementary appearance. Appearance drawing from perspective models and its applications.

MAT 1009 CALCULUS I (4+0)
Functions, types of functions, operations with functions, inverse functions, limit, indeterminate forms, continuity, derivative, geometric and physical interpretations of the derivative, theorems on derivetives, derivatives of functions, differential, Rolle's and mean value theorems, L'Hospital's rule, concavity, maxima and minima, Taylor and Maclaurin series, sketching the graphs of functions, indefinite integral, method of integrations, definite integrals, improper integrals, applications of definite integrals, some numerical evaluation of definite integrals, matrices, determinants, vectors, vector spaces and subspaces, linear independence, four fundemental subspaces, eigenvalues and eigenvectors, matrix functions, systems of linear equations, linear inequalities, convex sets, linear programming problem.

TBT 1001 FUNDAMENTALS OF INFORMATION TECHNOLOGIES (1+1)
Computers. Software. Programs for word processing, making calculations, making presentations. MATLAB program for mathematical calculations.

ATA 1001 PRINCIPLES OF ATATÜRK & REVOLUTION HISTORY I (2+0)

Modernization and Europe, revolution of French, westernization affairs of the Ottoman Empire, the Balkan wars, collapse of the Ottoman Empire. The first World War and armistice mudros, the emergence of the Turkish National Movement and organizations, Turkish National struggle and wars, Lausanne Place Treaty.

TDL 1001 TURKISH LANGUAGE I (2+0)

Definition and characteristics of language, relationship between language-nation, language-communication and language-culture, world languages and place of Turkish language among world language, historical development of Turkish language, Ataturk's language revolution and his comprehension and works about language, voice characteristics of Turkish language, spelling rules and applications, punctiation marks and practices, world knowledge, root-suffix and stem, construction suffix, conjugation suffix, world derivation.

MAK1021 WORKSHOP TRAINING (4 WEEKS) (3+3)

The aim of the workshop training is to improve the knowledge and ability of the students about the basic production techniques. Duration of the workshop training is five weeks. Fundamentals of dimensional measurement, foundry work patternmaking, welding and machining are given both theoretically and experimentally.

SECOND SEMESTER

BİL 1002 COMPUTER PROGRAMMING (2+2)

Introduction to programming in Visual basic. Variables. Data input and output in Visual basic. Loop. Control. Orientation. Series. Functions. Sub-programs. Display settings. Graphics drawing and animations.

FİZ 1012 PHYSICS II (3+2)

Properties of electric charges and electric fields. Gauss' law electric potential. Capacitance and dielectrics, current and resistance. Direct current circuits, magnetic fields, sources of the magnetic field, Faraday's law. Inductance, alternating current circuit, electromagnetic wawes, light and optics.

MEE 1004 TECHNICAL ENGLISH II (3+0)

These subjects are covered in English. Electric motor. Central heating. Safety at work. Washing machine. Racing bicycle. Lasers. Technician. Refrigerator. Scales. Portable generator. Road breaker. Disk brakes. Staff engineer. Lawn mower. Corrosion. Maglev train. Computer aided design. Supercar. Graphs. Waste recycling. Robotics. Careers. Applying for a job.

MAK 1016 TECHNICAL DRAWING II (4+0)

Computer aided drawing software and its tools. Three dimensional solid modeling construction techniques. Transfer of three dimensional machine components to two dimensional medium. Working drawings, standard machine components and their usage in drawing.

MAK 1018 / MEE 1018 STATICS (4+0)

Basic concepts and Newton's laws. Scalars and vectors. Two and three-dimensional force systems. Equilibrium of particles. Moment, couples and resultants. Free body diagrams. Equilibrium of rigid bodies in two and three dimensions. Planar trusses: Method of joints, method of sections. Frames and machines. Center of gravity. Area moments of inertia.

MAT 1010 CALCULUS II (4+0)

Coordinate systems; rectangular, polar, cylindrical and spherical coordinates; analytic geomety in plane; lines; conics, second order degree curves; ellips, hyperbola, parabola and circle; translation and rotation of coordinate axes and its applications; analytic geometry in space; lines and planes; quadratics; surfaces of second order degree; ellipsoids, hyperboloids and paraboloids; cylinders, sphere cones; functions of two or more variables; limits and continuity, partial derivatives, differentiability, linearizations and differentials; higher order derivetives, differentiations of composite and implicit functions, chaine rule, implicit differentiations, tangent plane, normal line, directional derivative, vector functions; gradient; divergence and curl of a vector function; Taylor's series; maxima and minima; constrained extrema, lagrance multipliers; double integrals, triple integrals, lines integrals, geometric and physical applications of double and triple integrals.

ATA 1002 1001 PRINCIPLES OF ATATÜRK & REVOLUTION HISTORY II (2+0)

Revolutions of Ataturk (Foundations of the Turkish Republic, the abolition of the caliphate, hat reform, calendar reform, civil law, new Turkish alphabet, Turkish language and history reforms, reforms of social life.). Principles of Ataturk (Republicanism, nationalism, populism, laicism, etatism, revolution), foreign policy of Ataturk, until today foreign and domestic policy of Turkey, from after death of Ataturk.

TDL 1002 TURKISH LANGUAGE II (2+0)

World and meaning ofit, real and figurative meanings of word, idioms, terms, language mistakes (about construction and meaning of world), construction of Turkish language sentence, elements of sentence, analysis of sentence, language mistakes (about deficiency of subject, complement and pericate), kinds of expression: Event articles (story, novel samples) apinion articles (essay, anecdote, samples), sensation articles (poem samples), notification, redord and report samples, petition, business letter and biography samples, kinds of discussion (problems of young generation, importance of affection and tolerance, education in our country, effects of media, human rights, environment problems, democracy, observation freedom, becoming modern, laicism).

THIRD SEMESTER

EEE 2015 ELECTRICS (3+0)

Basic concepts of electricity, Alternating Current and Phase Concept, Circuit Analysis in A.C., Power in A.C systems and Compensation, Electromagnetism, Magnetic Circuits, Midterm, Direct Current Motors and Generators, Alternating Current Motors and Generators, Control of A.C. Motors, Photovoltaic Systems, Fuel Cells and Batteries, Renewable energy sources: Wind and Water Turbines, Electrical Vehicles

MAK 2015 STRENGTH OF MATERIALS I (3+0)
Internal forces and stresses. Stress on an oblique plane. Normal stress and strain under axial loading. Hooke's law. Thermal stresses. Generalized Hooke's law. Shearing strain. Axial loading; plastic deformations, residual stresses. Torsion of shafts and shearing stresses. Design of transmission shafts. Plastic deformations, elastoplastic stresses and residual stresses in circular shafts. Torsion of noncircular members. Shear and bending-moment diagrams. Bending of beams and normal stresses. Bending of members made of several materials. Plastic deformations in beams subjected to bending, elastoplastic and residual stresses. Eccentric axial loading in a plane of symmetry.

MAK 2021 / MEE 2021 DYNAMICS (4+0)
Kinematics of particles: Rectilinear and curvilinear motion. Plane curvilinear motion: Rectangular, normal-tangential and polar coordinates. Space curvilinear motion: Rectangular, normal-tangential, cylindrical and spherical coordinates. Kinetics of particles: Newton's Second Law, Work-Energy and Impulse-Momentum Principles. Planar kinematics of rigid bodies: Rotation, motion relative to translating and rotating axes-relative motion, Coriolis acceleration. Planar kinetics of rigid bodies.

MAT 2011 MATHEMATICS III (4+0)
Differential equations and their solutions, first order differential equations and their solutions, higher order linear differential equations and thrir solutions, linear differential equations with constant coefficient, series solutions of linear differential equations, systems of linear differential equations, laplace transform and laplace transform solutions of linear differential equations.

MMZ 2027 ENGINEERING MATERIALS (4+0)
Investigation of the atomic structure, atomic bonding, crystalline structure, imperfections, diffusion, mechanical behaviors of solids.

FOURTH SEMESTER

EEE 2018 ELECTRONICS (3+0)
Basic Concepts in Electronics, AC to DC Conversion, Analysis of DC Circuits,Transistors and Applications, Operational Amplifiers and Applications, Sensors and Measurement, Introduction to Digital Electronics,PLC's, Microprocessors, Data Acquisition, D/A and A/D Converters.

MAK 2022 STRENGTH OF MATERIALS II (3+0)
Unsymmetric bending. General case of eccentric axial loading. Bending of curved members. The shear flow and shearing stress in the beam. Transformation of stress, principal stresses and maximum shearing stress. Mohr's circle. Yield and fracture criteria. Stresses in thin-walled pressure vessels. Transformation of plane strain, Mohr's circle, measurements of plane strain. Stresses under combined loadings. Design of transmission shafts. Deflection of a beam by integration method. Deflection of beams by Moment-area theorems. Columns: Stability of structures. Euler's formula, design of columns under an eccentric load. Energy methods. Impact loading. Castiglione's theorem. Deflections by Castiglione's theorem.

MAK 2024 / MEE 2024 THERMODYNAMICS I (3+0)
Concepts and definitions. Thermodynamic properties of pure substances. Ideal gas law and compressibility chart. Heat and work. First law of thermodynamics for closed and open systems. Carnot cycle, heat engine, refrigeration cycle and heat pump. Exergy and entropy, exergetic efficiency.

MAK 2026 FLUID MECHANICS (4+0)
Basic concepts. Hydrostatics. Conservation laws for closed and open systems. Differantial form of the conservation laws. Dimensional analysis of fluid systems. Analytic solutions and Poiseuille flows. Pipe flow, major and minor losses. Flow over a plate. Measuments of flow characteristics and data acquisition.

MAK 2028 ENGINEERING MATHEMATICS (3+0)
Solution of non-linear algebraic equations by Newton-Raphson method. Lagrange interpolation. Numerical integration. Solution of linear algebraic set of equations. Method of least squares. Solution of linear and set of lienar differential equations; MatLAB applications for analytical solutions by Laplace transforms; numerical solutions: Runge-Kutta method. Solutions with Visual BASIC programs.
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FIFTH SEMESTER

MAK 3017/MEE 3017 SYSTEM MODELING AND ANALYSIS (3+0)
Basic concepts in modeling the mechanical systems, Equations of motion of mechanical systems, Calculation of eigen values of mechanical systems with computers, Modeling of mechanical systems with computers, Electrical systems, Modeling of fluid and thermal systems, analogy between systems, Modeling of electromechanical systems, Linear systems and concept of transfer function, Solution of differential equation with Laplace transformation, Finding the response of linear systems to different inputs, Analysis of multi degree of freedom systems with state variables, numerical solution methods, Equation of motion of nonlinear systems and linearization

MAK 3019 MANUFACTURING PROCESSES I (3+0)
Definition of casting and its advantages, solidification in casting, specific cases in solidification of metal melts, Metal casting processes, sand casting, moulding methods in sand casting. Melting and casting at sand casting. Die casting, centrifugal casting, investment casting, continuous casting etc. Finishing processes of casting, casting defectsand its control, part design at casting, Fundamentals of plastic metal forming. Introduction to methods of plastic metal forming. rolling, forging, extrusion, drawing. Sheet metal forming processes.

MAK 3025 MECHANISMS (3+0)
Kinematic diagrams. Kinematic pairs of elements and degree of freedoms, kinematic chains, equivalent mechanisms, degree of freedom of mechanisms. Instantaneous center of rotation. Displacement, velocity and acceleration analyses of mechanisms. Kinematic analysis of gears and gear trains. Cams and cam design.

MAK 3027 MACHINE DESIGN I (4+0)
General descriptions. Mechanical properties of materials. Tolerances and surface roughness. Static and fatigue design criteria. Mean and combined stresses. Design of permanent and detachable joints: welded, riveted and bolted connections. Screws. Transmission bolts. Keys, pins and rings. Springs.

MAK 3031 /MEE 3031 THERMODYNAMICS II (3+0)
Entropy generation, isentropic processes. Isentropic efficiency. Gas and vapor power cycles; Otto and Diesel cycles, Brayton cycle, Rankine cycle, properties of reheat and regeneration. Cooling cycle. Gas mixtures and humid air.

MAK 3033 HEAT TRANSFER (3+0)
Introduction to Heat Transfer. General heat diffusion equations. Boundary and initial conditions. One- and two-dimensional steady-state conduction. Radial systems. Heat transfer from extended surfaces. Numerical analysis (Finite Difference equations). The lumped capacitance method. Heat convection. Hydrodynamics and the thermal boundary layer. Laminar and turbulent flow. External flow. Flow across banks of tubes. Internal flow.

SIXTH SEMESTER

MAK 3008 MACHINE DESIGN II (4+0)
Supporting elements: axles, shafts and bearings. Critical velocity. Motion and power transmission elements: Belt and chain drives, gears and gear systems. Connection elements: Clutches, brakes and couplings.

MAK 3012 HEATING AND VENTILATION (3+0)
Physiological fundamentals. Basic principles of thermal comfort. Heat loss calculations. Heating systems and application principles. Design principles of heating installations. Equipment and components used in heating systems. Calculations of pipelines. Fundamentals of heating installation projects.

MAK 3018 DYNAMICS OF MACHINERY (3+0)
Statics, Newton's laws and D'Alembert's principle; Kinetostatics, calculation of bearing reactions, Principle of virtual work, input-out relationships; dynamics of reciprocating machinery, cam dynamics, tooth forces; principles of mass balancing, balancing of rotatory masses, balancing of reciprocating masses, balancing of linkage mechanisms, balancing applications in industry; damped free vibration of 1 dof systems; transient vibration of 1dof systems; vibration of 1 dof systems under harmonica forcing; resonance; bending and torsional virations of shafts; vibration isolation and its applications; CAD software related to dynamics of machinery.

MAK 3026 /MEE 3026 CONTROL SYSTEMS (3+0)
Concept Of Control And Introduction To Control Systems, Automatic Control In Engineering Systems, Classification Of Control Systems, Structural Elements Of Control Systems, Types Of Controllers, Design Of The Controllers And Their Time Domain Analysis, Stability Of Control Systems, Root Locus, Control System Design Using Root Locus, BODE Diagrams And Relative Stability Analysis, State Space Control

MAK 3028 MANUFACTURING SYSTEMS (3+0)
Definition of welding. Classification of welding processes and electric arc welding. Arc physics. Welding machines and equipments. Adjusting and control of welding machines. Electrodes. Selection of electrodes. The metallurgy of welding, welding defects. Gas metal arc welding. Submerged arc welding. Oxyfuel gas welding and pressure welding. Machining.

MAK 3030 APPLIED STATISTICS IN MECHANICAL ENGINEERING (3+0)
Introduction to statistics, probability distribution functions, distribution scales, probability notions, random variables, theoretical distributions, discontinuous distributions, continuous distributions, hypothesis, testing and reliance intervals, correlation and regression analyses, measuring and assessment in engineering, measuring errors, roots of error, calibration errors, data acquisition errors, statistical assessments of these.

SEVENTH SEMESTER

MAK 4097 MEASUREMENT AND ANALYSIS LABORATORY IN MECHANICAL ENGINEERING (0+2)
Mechanical and thermal experiments, experimental design projects.

MAK 4099 RESEARCH PROJECT (0+4)
Project topics, which may be principally experimental, will be chosen in consultation with the project supervisor (approval by the Chair is required).

EIGHTH SEMESTER

MAK 4004 PROGRESSION TO PROFESSION (2+0)
Prsentations are given by the invited speakers on the working areas of mechanical engineers.

MAK 4098 GRADUATION PROJECT (0+6)
Projects are chosen in consultation with the project supervisor (approval by the Chair is required).

ELECTIVE COURSES

END 2013 STATISTICS I (3+0)
Basic probability and random variables, special distributions and their applications, relations between distributions, functions of random variables, functions which generate moment, random sampling, data definition and sample distributions.

END 3022 QUALITY CONTROL (3+0)
Fundamentals of quality, statistical quality control, control charts according to variables, control charts according to symptomes, control charts for special cases, acceptance sampling plans according to variables and symptomes, experiment design.

END 3023 ERGONOMICS (3+0)
Definition of ergonomy, aim and scope, study of human body in terms of ergonomy, engineering antropometry, human-machine systems, working environment factors.

END 4046 MANAGEMENT (3+0)
Trade unions, unions for officials, work contracts, strike and shutout.

END 4051 PRODUCTION PLANNING (3+0)
Capacity planning, inventory control, methods for sorting and tabulating.

MAK 4025 OPTIMIZATION (3+0)
Historical progress of optimization and its application areas in engineering. Classification, formulation and general mathematical models of optimization problems. Graphical method. Classical optimization techniques. Linear and nonlinear programming, geometrical programming. Stochastic optimization.

MAK 4026 SOUND AND NOISE CONTROL (3+0)
Definition of sound and noise. Basic concepts on sound. Sound fields. Classification of noise. Measurement of noise. Basic principles of noise control. Industrial noise. Environmental noise. Standarts on noise control.

MAK 4028 AUTOMATION AND ROBOTICS (3+0)
Sensors and actuators. Servo motors and drivers. DC motors and drivers. Fluid power systems. PLC and PC based control. Design, analysis and programming of robots.

MAK 4029 OPERATIONS RESEARCH (3+0)
Introduction to linear programming. Graphical solution and optimization. Simplex method for linear programming. Duality and sensitivity analysis in linear programming. Transportation model and various transportation models. Network flows (models). Stock control models, Advanced linear programming.

MAK 4031 MACHINE TOOLS (3+0)
Fundamentals of cutting: Mechanics of chip formation. The types of chips produced in metal-cutting. Cutting forces and power. Tool life. Machinability. Tool materials and cutting fluids. Lathes and lathe operations. Turning parameters. Milling operations, milling machines and process parameters. Broaching, broaching machines and tools. Boring and boring machines. Drilling and drills. Reaming and reamers. Cutting screw threads. Sawing. Grinding process, grinding operations and machines. Finishing operations. Design considerations for machining. NC and CNC machine tools.

MAK 4032 NON-DESTRUCTIVE TESTING (3+0)
The classification of material testing methods. Penetrant testing methods. Testing methods using magnetic particles. Testing with infrared rays. Eddy-current testing. Ultrasonic testing. Testing with X and gamma rays. Some norms of validity criterions in quality control.

MAK 4033 AIR CONDITIONNING (3+0)

Indoor air quality. Thermal comfort. Design conditions of internal and external surroundings. Cooling load analysis. Thermodynamics processing of moist air (psychometrics). Air conditioning processes. Summer and winter air conditioning. Heat recovery systems. Duct design and automatic control.

MAK 4038 STEAM BOILERS (3+0)

Steam and power systems. Types of steam boilers. Elements of steam boilers. Fuel and combustion analysis for steam boilers. Thermal analysis and thermodynamics of steam boilers. Thermal efficiency of steam boilers. Chimney loss.

MAK 4039 FUELS AND COMBUSTION (3+0)

The combustion process, first and second law analysis of reacting systems, chemical equilibrium, classification of flames, nitrogen-oxides and other emissions: the effects and precautions, basic design principles for liquid and gas combustors.

MAK 4041 MECHANICAL VIBRATIONS (3+0)

Effects of vibration. Sources of vibration. Mathematical modeling of mechanical systems. One degree of freedom systems. Harmonic and periodic forcing. Frequency response function. Transient forcing. The convolution integral. Shock spectra. Multi-degrees of freedom systems. Modal analysis. Vibration control. Measurement of vibration. Vibration tests. Vibration based fault diagnosis and preventive maintenance.

MAK 4042 REFRIGERATION MACHINES (3+0)

Definition and properties of refrigerants. Halocarbon and ammonium refrigeration systems. Refrigeration by brine, multi-pressure refrigeration systems. Calculation of cooling load. Cooling system components: Condensers, evaporators, cooling towers.

MAK 4044 SOLAR ENERGY (3+0)

Sky geometry and solar radiation. The radioactive properties of materials with respect to solar radiation. Theory of the flat-plate solar collectors. Performance determination. Energy storage. Hot water preparation systems with solar energy. Heating with solar energy and system design.

MAK 4046 CORROSION (3+0)

Oxidation; thermodynamics of oxidation, kinetics of oxidation, investigation of oxides. Electrochemical corrosion; introduction of anode and cathode, galvanic cells, types of anodic dissolution polarization, experimental techniques for corrosion testing. Passivity. Corrosion types influenced by mechanical factors; stress corrosion, hydrogen embrittlement, corrosion fatigue, other types of corrosion. Protection from corrosion; classification of protective techniques, cathodic protection, anodic protection, preparation of surfaces and protective coatings, design techniques for corrosion protection, corrosion and cleaning methods for steam generators, corrosion of heat exchangers.

MAK 4047 THERMIC TURBO MACHINERY (3+0)

Steam and gas flows through nozzles. Linear and Angular momentum principles. Euler equation, velocity diagrams. Thermodynamic relations for stationary and rotary blades. Basic principles of radial and axial turbines.

MAK 4048 HYDRAULIC MACHINERY (3+0)
Classification of hydraulic machines. Francis, Kaplan, Uskur and Pelton turbines. Comparison of action and reaction turbines. Pumps: Types, Characteristics, Operating curves. Serial and parallel connection of pumps. Cavitation. Special pump types

MAK 4049 MEASUREMENT AND SIGNAL PROCESSING (3+0)
Control system instrumentation. Sensors. Circuits with op-amps. Transfer functions of mechanical systems and circuits. Eigen-values. Spectrum. FFT. Impulse and step response by Laplace transform method. Measurement of strain. Lab. Projects on vibratory systems and electrical circuits.

MAK 4051 INTRODUCTION TO FRACTURE MECHANICS (3+0)
Stress and strain relationships. Biaxial and triaxial stress states. Plane stress – plane strain conditions. Equations of equilibrium. Griffith energy balance. Strain energy release rate. Irwin and Orowan's modifications to Griffth energy balance. Definitions of linear elastic and elastic plastic fracture mechanics. Stress intensity factor. Modes of loading. Fracture toughness. Specimen types. Field equations for various loading types. Crack tip opening displacement. J integral. Fatigue crack propagation.

MAK 4052 GEARS (3+0)
Basic theory of gears and gear trains, gear profiles. Spur gears, helical gears. Measurement of gears, quality control. Distribution of displacement to gears. Manufacturing methods of gears. Strength calculations of spur gears. Worm gears. Bevel gears. Gear trains. Lubrication in gear trains.

MAK 4055 FUNDAMENTALS OF ENERGY MANAGEMENT (3+0)
Basic concepts of energy, Energy demand and human dependence on energy, Principles of energy management, Energy audit, Thermal insulation in buildings, Heat recovery systems, Cogeneration systems

MAK 4056 GEOTHERMAL HEATING SYSTEMS (3+0)
Introduction to geothermal energy. Direct and indirect utilization of geothermal energy. Geothermal district heating systems, downhole heat exchangers, greenhouse design, heat pumps.

MAK 4061 COMPUTER AIDED DESIGN (3+0)
Design criterias, the finite element method, static anaylsis, modal analysis, buckling analysis, fatique analysis, non-linear analysis, drop test, assembly.

MAK 4064 NUMERICAL CONTROLLED MACHINES (3+0)
Basic concepts about CNC machines, Control panels, Programming principles of horizontal and vertical machining centers, Programming principles of horizontal and vertical lathes.

MAK 4065 ELEVATOR TECHNOLOGIES (3+0)
Elevator systems, EN 81-1/2 standards, elevator application project, elevator electricity, escalatots.

MAK 4066 SYNTHESIS OF LINKAGE MECHANISMS (3+0)
Introduction to mechanism synthesis, Use of graphical and analytical methods in dimensional synthesis for two, three and four positions of four linkage mechanisms. Classical Transmission angle problem.

MAK 4070 EXPERIMENTAL MECHANICS (3+0)
Mechanical properties for isotropic materials. Strain-gauges. Mechanical properties for composite materials. Impact experiments. Hardening experiments.

MAK 4072 PLASTIC TECHNOLOGIES (3+0)
General information about raw plastic materials (thermoplastics, thermosets and elastomers), introduction of plastic additives, preparation of raw materials, identification of test methods used for plastics. Plastic forming processes (injection, extrusion, thermal forming) and definition and causes of defects related to these processes. Plastic part design criteria, injection mold design and manufacturing stages (mold cores, runners selection, cooling and driving systems). Joining of plastic parts by welding (ultrasonic, hot plate and gas welding) and their basic processes - design principles.

MAK 4073 INTRODUCTION TO FINITE DIFFERENCE (3+0)
Explanation of numerical solution and finite difference and finite volume methods of heat transfer mechanisms. MATLAB and computer aided solution of steady-state and transient heat transfer problems. Advanced numerical methods. Numerical analysis of heat transfer problems with a software package which uses finite volume method. Numerical analysis of fluid flow problems. Design of a thermal system.

MAK 4074 MECHATRONICS (3+0)
Fundamentals of AC and DC, Measurement, Kinematic Analysis, Oscilloscope, Basic Electronic Components, Control Units, Sensors, Fundamentals of AC and DC motors, Hydraulics and Pneumatics Valves,   Hydraulics and Pneumatics Actuators, Microprocessor Programming, Mobile Robots and Telemetry, Fuzzy Logic and ANN.

MAK 4075 ELECTRICAL AUTOMATION TECHNIQUE (3+0)
Closed-loop Control, Measurement Devices, AC/DC, Actuators, Sensors and Controllers, Fundamentals of Electricity, Compensation, Logic Circuits, PIC programming, PLC and HMI Programming, OpAmps, CA Circuit Design and Circuit Printing Methods, Hydraulics and Pneumatics, Electric Motors and Drivers, Modern Control Techniques, PV's and Wind Turbines, Wireless Communication and Telemetry

MAK 4076 PNEUMATIC AND HYDRAULIC SYSTEMS (3+0)
Components of fluid power systems. Calculation of pressure losses. Computer aided analysis of fluid power circuits. Laboratory works.Automation by using PLC. Servo systems.

MAK 4077 BASES AND TECHNIQUES OF PREDICTIVE MAINTENANCE (3+0)
Introduction to machine condition monitoring. Applications of vibration based methods of machine condition monitoring and fault diagnostics for rotating machines. There will be a laboratory component that will provide the students with demonstrations and the opportunity to collect and analyze vibration data from a set of mechanical fault simulators.

MAK 4078 LIFTING MACHINERY (3+0)
Calculation methods of cranes. Calculation of truss beam and solid body beam systems. Design details of cranes. Portal cranes. Wall cranes. Slewing cranes. Derrick cranes. Slewing cranes with fixed column. Slewing discus cranes.

MAK 4079 ADVANCED MACHINE DESIGN (3+0)
General rules of machine design. Design principles of parts for casting, welding, and forging. Design of sheet metals. Design for assembly and transportation. Design of bearings. Sealing. Examination of design examples.

MAK 4080 COMPUTER AIDED ENGINEERING WITH INDUSTRIAL APPLICATIONS
Introduction and Importance of the Computer Aided Engineering, Road Map for the Computer Aided Engineering Works, Elastic Stress Analyses, Elasto-plastic stress analyses, Factor of Temperature, Steady-State Thermal Analyses, Transient Thermal Analyses, Vibration Analyses, Fatigue Analyses

MAK 4081 TRANSPORT TECHNOLOGY (3+0)
Components of hoisting and conveying machines: ropes, hooks, chains, pulleys, drums, brakes, electric motors. Band conveyors with rubber, wire and steel members. Elevators. Scrapers. Chain conveyors. Roving conveyors. Roller and wheel conveyors. Vibrating conveyors. Pneumatic conveyors.

MAK 4082 COMPOSITES MANUFACTURING TECHNOLOGY (3+0)
Introduction to composite materials. Theory of composite materials. Reinforcements and matrices. Method selection and design for manufacturing, introduction to the manufacturing techniques. Hand lay up/automated composite layup, spray up / automated spray up, Vacuum bagging, vacuum assisted resin infusion processes, Autoclave and filament winding method, Pultrusion, resin transfer molding –RTM, Sandwich constructions, thermoforming, compression moulding/extrusion, other manufacturing techniques.

MAK 4083 WELDING TECHNIQUE (3+0)
Welding of fine grain high strength steels, welding of cast irons, maintenance welding, welding of stainless steels, welding of cryogenic materials, welding of high temperature steels, welder test, procedure test, welding performance qualification, TTT diagrams, CT diagrams, brazing.

MAK 4084 STRUCTURAL ELEMENTS OF MOTOR VEHICLES (3+0)
Wheels. Driving elements. Suspension systems: wheel suspensions, springing, damping. Brake systems, brake force distribution, anti blocking systems. Steering system: steering wheel geometry-gearboxes- power steering. Automobile chasis and body.

MAK 4085 INTRODUCTION TO FINITE ELEMENTS (3+0)
Finite elements method is a numerical method that can be applied to obtain solution to a variety of problem in engineering. Basic steps in the finite elements method: creating and discretizing the solution domain into finite elements, assuming a shape function, construction of element and global stiffness matrixes, calculation of forces, applying boundary conditions and solution of system equations.

MAK 4086 INTERNAL COMBUSTION ENGINES (3+0)

Classification of engines. Engine cycles, characteristics and efficiencies. Kinematics of slider-crank mechanisms. Engine balancing. Fuels, detonation, oils, mixture constitution, carburetors. Fuel injection for spark ignition engines. Ignition and combustion theory in Otto engines. Diesel engines. Turbocharged engines and their performance. Problems of exhaust gases (emissions). Noise, scent. Functions and manufacture of engine parts.

MAK 4087 MECHANICS OF COMPOSITE MATERIALS (3+0)

Introduction to composites; matrix materials and reinforcements, application areas. Classification of composite materials and manufacturing methods. Macro-mechanics of a composite lamina: stress-strain relationships, reasons for failure of composite materials (environmental effects, fatigue, impact loading), failure criteria and sample problems. Micro-mechanics of a composite lamina. Macro-mechanics of laminated composites; calculation of stiffness matrices (A, B, D), calculation of stresses and sample problems. Characterization of composite materials; sample preparation, devices and equipments, tensile and compressive properties, shear properties, flexural properties. Design criteria, design of a simple composite structure and creation of lamination plan. Sample design of a simple composite structure by finite element method.

MAK 4088 HEAT TRANSFER II (3+0)

Introduction to convection. External flow, internal flow. Natural convection. Boiling and condensation. Radiation: Processes and properties. Heat transfer by radiation between two surfaces.

MAK 4089 BASIC PRINCIPLES OF MOTOR VEHICLES (3+0)

Forces acting on vehicles: power distribution, wheel forces, air resistance, grade and acceleration resistance, limits of power transmission, brake forces, curve motion and overturning. Driving machinery. Otto and Diesel engines, special purpose designs, reciprocating engines, gas turbines, electrical drive, hybrid drive systems. Velocity and moment converters: clutches, mechanical and hydraulic gearboxes. Power diagrams. Brake systems.

MAK 4091 ANALYSIS OF TRAFFIC ACCIDENTS (3+0)

Determination of traffic accidents and accident reports. Accident traces and its interpretation. Post-accident data tracking. Calculation of the velocities of the crashed vehicles. Determination of accident location. Accident avoidance observations. Time-displacement diagrams. Determination of direction of motion of pedestrians prior to accident. Accidents occuring at nighttime. Responsibility areas of traffic accident experts. Traffic accident analyses by examples.

MAK 4093 HEAT EXCHANGERS (3+0)

Classification of heat exchangers. The overall heat transfer coefficient. Effect of fin parameters on the overall heat transfer coefficient. The logarithmic mean temperature difference. Correcting factors. Effectiveness. Delaware method. Heat exchanger design in the phase change of one of the fluids. The design properties of condenser and evaporator.

MAK 4095 FLUID MECHANICS II (3+0)
Concept of boundary layer. Boundary layer and velocity distribution in turbulent flow. Drag in objects embedded in a moving fluid, Stokes law, effect of compressibility on drag. Navier-Stokes equations. Potential Flows. Dimension analysis. Compressible flows.

MMZ 3002 PLASTIC SHAPING (3+0)
Relations between stress and shape during plastic deformation, Fundamentals of plastic deformation, factors affecting plastic deformation, annealing furnaces used for plastic shaping, forging, rolling, extrusion, wire drawing, pipe manufacturing and sheet metal forming methods.