MMÜ 103 Computer Programming (2.2.3) ECTS 5

OMÜ 104 Introduction to Automotive Engineering (2.0.2) ECTS 5

MMÜ 106 Engineering Graphics (2.3.3) ECTS 6
Freehand sketching techniques, use of scales, model representation. Orthographic projection. Dimensioning and sectioning. Solid Modeling. 3-D drawings. Assembly and working drawings. Tolerancing. Threaded parts, keys, springs, rivets, piping layouts. CATIA is introduced and used throughout the course with coverage of advanced modeling tools.

MMÜ 202 Numerical Analysis (3.0.3) ECTS 5

MMÜ 203 Statics (3.0.3) ECTS 5
Statics of particles, forces in a plane and space. Equivalent system of forces. Equilibrium of rigid bodies in two and three dimensions. Centroids and centers of gravity. Analysis of trusses, frames, and beams. Friction. Moments of inertia.

MMÜ 204 Dynamics (3.0.3) ECTS 7

MMÜ 205 Thermodynamics (4.0.4) ECTS 7
Properties of pure substances, phase change, equation of state. Concepts of energy transfer by heat, work and mass. Entropy. 1st and 2nd law of Thermodynamics and their applications to common thermal devices such as heat exchangers, turbines, compressors and nozzles. Basic power and refrigeration thermodynamic cycles: Otto, Diesel, Brayton, Rankine and vapor compression refrigeration cycles.

MMÜ 208 Mechanics of Materials (4.0.4) ECTS 7

MMÜ 209 Materials Science (3.0.3) ECTS 6

MMÜ 214 Manufacturing Engineering (3.2.4) ECTS 5

MMÜ 218 Applied Mathematics for Engineers (3.0.3) ECTS 5
MMÜ 242 Numerical Analysis (3.0.3) ECTS 5
Approximations and error definitions: Significant digits, computer representation of numbers and round-off errors, computer
arithmetic, truncation errors. Roots of equations: Bracketing methods, open methods, roots of polynomials, systems of nonlinear
equations. Systems of linear algebraic equations: Gauss elimination, matrix inverse, Gauss-Jordan, LU decomposition, Gauss-
Romberg integration, Gauss quadrature (Gauss-Legendre formulas). Ordinary differential equations: Initial value problems and
Runge-Kutta methods, systems of ordinary differential equations, stiffness, boundary-value problems. This is a service course
offered to Industrial Engineering Department.

MMÜ 244 Manufacturing Processes and Engineering (3.0.3) ECTS 5
Mechanics of cutting and cutting tools. Joining processes. Micro/nano processes. This is a service course offered to Industrial
Engineering Department.

MMÜ 251 Materials Science (3.0.3) ECTS 5
Introduction to materials science and engineering. Atomic structure and interatomic bonding. Crystal and amorphous structures in
thermal, magnetic and optical properties of materials. This is a service course offered to Industrial Engineering Department.

MMÜ 261 Engineering Mechanics (3.0.3) ECTS 5
Unified treatment of statics and mechanics of materials. General principles and force vectors. Equilibrium of particles and rigid
bodies. Structural analysis. Internal forces. Friction. Center of gravity and centroids. Stress and strain. Mechanical properties of
materials. Axial loading, torsion, bending, transverse shear, combined loadings. Design of beams and shafts. Deflections of beams
and shafts. Buckling of columns. Energy methods. This is a service course offered to Industrial Engineering Department.

MMÜ 265 Fluid Mechanics (4.0.4) ECTS 6
Concept of continuum. Properties of fluids: density, viscosity, surface tension. Forces on submerged surfaces. Integral and
differential forms of mass, momentum and energy conservation equations. Solutions of simple viscous flows. Dimensional
analysis and similitude. Viscous flow in pipes and ducts. Flow past immersed bodies, boundary layers, lift and drag, and
turbulence.

MMÜ 266 Heat Transfer (4.0.4) ECTS 6
1D and 2D steady-state conduction. Transient conduction: Lumped capacitance analysis, multidimensional effects. Convection:
thermal boundary layer, boundary layer similarity and Reynolds analogy. Heat transfer in external flows: flat plate, cylinder in
cross-flow, sphere. Internal flow: hydrodynamic and thermal considerations, convection correlations. Free convection. Radiation
heat transfer. Heat exchangers.

MMÜ 307 Design of Machine Elements (3.0.3) ECTS 5
Failure theories, safety factors, and reliability. Impact. Fatigue. Surface damage. Applications: Design of threaded fasteners,
power screws, rivets, springs, bearings, gears, shafts, clutches, and brakes.

OMÜ 308 Internal Combustion Engines (3.0.3) ECTS 5

MMÜ 309 Theory of Machines (3.0.3) ECTS 5
Basic concepts, degrees of freedom, classification of mechanisms. Kinematic analysis of mechanisms: Position, velocity,

MMÜ 324 System Dynamics and Control (3.0.3) ECTS 5
Introduction to system dynamics and control. Closed and open loop controls. Laplace transform. Transfer function and state-space
approach to modeling dynamic systems. Analyses and modeling of mechanical, electrical, electromechanical, fluid and thermal
controls.

OMÜ 329 Principles of Chassis and Drivetrain Components (3.0.3) ECTS 5
Automotive chassis components: Suspensions types and kinematics. Steering kinematics and components. Tire components and
performance analysis. Friction and retarder brakes. Drive train components: Clutches and torque convertor. Manual, automatic,
dual clutch gearboxes and other common types. Kinematics and force analysis of open differential. Limited slip differentials.
Cardan and rzeppa drive shaft joints.
OMÜ 332 Vehicle Component Design (3.0.3) ECTS 5

MMÜ 340 Mechanical Vibrations (3.0.3) ECTS 5

OMÜ 403 Vehicle Dynamics (3.0.3) ECTS 5

OMÜ 404 Vehicle Body Production (3.0.3) ECTS 5

MMÜ 407 Stress Analysis (3.0.3) ECTS 5

MMÜ 409 Mechatronics (3.2.4) ECTS 5

OMÜ 410 Fuel Cells (3.0.3) ECTS 5

MMÜ 412 Mechatronic Design (3.0.3) ECTS 5
Programming of electronic boards, fundamental actuators (DC motors, AC motors, servo motors, stepper motors, selenoids), fundamental sensors (Infrared, pressure, sonar, force), fundamental control algorithms, fundamental mechanisms and designs.

OMÜ 414 Internal Combustion Engine Design (3.0.3) ECTS 5

MMÜ 419 Dynamics of Machinery (3.0.3) ECTS 5
MMÜ 420 Finite Element Analysis (3.0.3) ECTS 5

OMÜ 423 Vehicle Thermal Engineering (3.0.3) ECTS 5

OMÜ 424 Vehicle Aerodynamics (3.0.3) ECTS 5

MMÜ 427 Applied Computational Fluid Dynamics (CFD) (3.0.3) ECTS 5

OMÜ 430 Automotive Powertrains (3.0.3) ECTS 5

OMÜ 433 Automotive Sensors and Measurement Technology (3.0.3) ECTS 5
Measurement methods, sensor support systems, noise, basic physics concepts (electric field, magnetic field, waves, inertia), detection principles, automotive sensor applications.

MMÜ 440 Theoretical and Experimental Methods in Mechanical Vibrations (3.0.3) ECTS 5

OMÜ 443 Principles of Vehicle Crash Safety (3.0.3) ECTS 5

MMÜ 453 Computer Aided Design (3.0.3) ECTS 5

MMÜ 456 Microcontrollers and Analog Interface Design (3.2.4) ECTS 5
Principles of microcontroller architecture and real-time software. Real-time operating systems (RTOS). Sensors and actuators and how they can be interfaced with a microcontroller. Basic communication methods using microcontrollers i.e. SPI, I2C, UART etc. Closed-loop control systems i.e. PID etc. and how these control algorithms are implemented on microcontrollers.

OMÜ 464 Automotive Logistics Management (3.0.3) ECTS 5

MMÜ 466 Computational Multi-Body Dynamics (3.0.3) ECTS 5
Spatial kinematics: Vectors, transformations, kinematics of particles and rigid bodies, forward and inverse kinematics. Dynamics of rigid bodies: Direct and inverse dynamics, analytical techniques, constraint formulation, contact modelling with friction, introduction to three-dimensional dynamics, inertial properties of rigid bodies, moment-free motions, gyroscopic effects.
Numerical simulation of multi-body systems. Introduction to multi-body dynamics simulation software. Introduction to flexible multi-body dynamics.

**OMÜ 470 Electric and Hybrid Vehicle Technology (3.0.3) ECTS 5**

**OMÜ 473 Material Selection in Automotive Engineering (3.0.3) ECTS 5**

**OMÜ 491 Graduation Project I (0.3.1) ECTS 6**
An original research project or a design project carried out under the supervision of a faculty member to integrate and synthesize the knowledge gained throughout the program. Student progress is followed by the supervisor via weekly meetings. Projects leading to physical prototypes are especially encouraged. Students may work independently or in teams on projects approved by the department. In case of a group project, the responsibilities and tasks of each student should be clearly defined. The course grade determined by the supervisor is based on the progress of the student throughout the term and an interim report submitted by the student or group.

**OMÜ 492 Graduation Project II (0.3.1) ECTS 6**
An original research project or a design project carried out under the supervision of a faculty member to integrate and synthesize the knowledge gained throughout the program. Student progress is followed by the supervisor via weekly meetings. Projects leading to physical prototypes are especially encouraged. Students may work independently or in teams on projects approved by the department. In case of a group project, the responsibilities and tasks of each student should be clearly defined. The course grade determined by the supervisor is based on the progress of the student throughout the term and an interim report submitted by the student or group.

**OMÜ 493 Special Topics in Automotive Engineering I (3.0.3) ECTS 5**
Topics that the undergraduate course catalog does not contain. Recent and special topics of automotive engineering research. Developments in hybrid and fuel cell car technologies, novel materials, applications of micro/nano technologies and safety.

**OMÜ 494 Special Topics in Automotive Engineering II (3.0.3) ECTS 5**
Topics that the undergraduate course catalog does not contain. Recent and special topics of automotive engineering research. Developments in hybrid and fuel cell car technologies, novel materials, applications of micro/nano technologies and safety.