



**RIGA TECHNICAL  
UNIVERSITY**

## **FACULTY OF TRANSPORT AND MECHANICAL ENGINEERING**

**Please note! This is a preliminary list of courses for the study year 2019/2020. Changes may occur!**

### **AUTUMN 2019 BACHELOR COURSES**

#### **MMP219 Resistance of Materials (for mechanical engineering) Part 1**

*2.00 CP (3.0 ECTS)*

Basic hypotheses. Matematik's model. Calculation chart. Forces. Stress. Deformation. Strain. Compressions. Strength calculation. Strength theory. Torsion. Bend. The experimental tasks. Flexibility grounds. The general principles and theorems. Displacements. Buckling. Dynamic tasks. Impact at. Long term strength. Plate and shell. FEM Method: Bending Beam and Buckling. System stability.

#### **MMP302 Mechanics of Deformable Firm Bodies**

*3.00 CP (4.5 ECTS)*

Deformable body. Stresses. Displacements. Mathematical model. Calculation scheme. Deformation analysis. Stress theory. Mechanical properties. The experimental tasks. The general principles and theorems. Variations method. Ritz method. Bar theory. Plates. Shells. FEM method. A computer program complexes.

#### **MRA353 Electro, Pneumo and Hydro automatics**

*3.00 CP (4.5 ECTS)*

The energy supply and processing elements of electric, pneumatic and hydro-automatic (EPH) systems, information input elements, signal processing and executive elements, the structure and operating principle. Types of equipment operation algorithm. Operational algorithm realization with pneumatic, hydraulic and hard logic electrical elements.

Programmable controller (PLC) design and management programmes for the system's algorithm. Computer aided selection, calculation, and system performance modelling of the electric, pneumatic and hydro-automatic system components.

#### **MSE201 Heat Study**

*2.00 CP (3.0 ECTS)*

The course "Basics of Thermal Engineering" includes topics related to the thermal phenomena in various systems, processes and power plants: Thermodynamic systems and parameters. Basic laws of thermodynamics. Specific heat, internal energy, entropy. Processes and cycles. Water and steam tables and charts. Humid air. Cycles of thermal machines. Steam power equipment. Heat transfer with conduction, convection, radiation. Complex heat transfer. Design methods of heat exchangers. Fuel and combustion theory. Water and steam boilers. Heat utilizing equipment.

#### **MSE305 Hydro- and Gas Dynamics**

*3.00 CP (4.5 ECTS)*

The subject contains consideration of properties of liquids and gases, hydrostatic forces, pressure definition. The Fluid Dynamics course is based on motion equations of liquids and gases. Real flows described in terms of border layer equations and turbulence length. Non dimensional methods used for process modelling. Heat losses and flow types are analysed. Methods of pipe, valve, pump and fan selection. Flow parameters described in nozzles, channels, around the body.

**MTH301 Machine Dynamics and Strength**

3.00 CP (4.5 ECTS)

Mechanism, machine, classification. Dynamics of machines and mechanisms. Free, forced and parametric oscillations of machine elements. Vibration protection of machines. Friction in machines. Motion irregularity of machine elements. Analysis and calculations of machine elements on reliability, stability, fatigue strength, impact load. Creep and stress relaxation in machine elements. Practical application of vibration effects in engineering (technological vibromachines, vibrodiagnostics of defects, etc).

**MTM341 Numerical Analysis in Engineering Mechanics**

2.00 CP (3.0 ECTS)

Analysis of functions and functionals. Extreme values. Optimisation tasks. Numerical analysis of simple analytical expression and experimental data. Analysis and operation of physical and engineering systems by using mathematical techniques. Dynamic analysis of mechanical, hydraulic and thermal systems. Response of these systems to initial conditions, and to transient, steady and random inputs. Stability. Analysis of simple feedback systems.

**MSE387 Heat Supply Systems**

2.00 CP (3.0 ECTS)

The Heat Supply Systems course is based on education and practical appliance of heat production, transmission and consumption technique. The theoretical background of the course is based on traditional and innovative technologies in the field of cogeneration and boiler houses, district heating networking of all dimensions, as well as in-house heating and tap water supply systems. Theoretical skills are strengthened by practical exercises using IT tools for efficiency and appliance calculations. Course supplies the background in national technical and construction code requirements regulating particular business area.

## MASTER COURSES

**MTH505 Rotary Machines (graduate)**

3.00 CP (4.5 ECTS)

Rotating parts of structures, shafts of energy and transportation machinery parts. A key initiative of the dynamic load factor, rotor disbalance. The dynamic calculation methods are analysed. The rotor balancing methods are considered. Within the framework of the present study subject the students should perform independent work on the following themes: 1st Supercritical speed, calculation; 2nd Differential equations of rotor oscillation with two degrees of freedom; 3rd Dynamic load for the rotor supports.

**MMP532 Mechanics of Composite Materials (graduate)**

3.00 CP (4.5 ECTS)

Composite materials. Fibers. Matrix materials. Types of composite materials. Calculation of the stresses and strains in composite materials. The methods and models of micromechanics of composites. The model of the unidirectional composite. The model of the composite, armed with short fibers. FEM application in the micromechanics of composite materials. Macromechanics of composites. Strength and fracture in composites.

**MSE541 Theory of Boundary Layer (graduate)**

4.00 CP (6.0 ECTS)

Study course is planned for extended studies of heat and mass transfer, fluid mechanics and aerodynamic theory and practical applications. The main emphasis is on the convective heat exchange and the related phenomena of flow mechanics. Basic topics: Hydrodynamic and thermal boundary layers. Laminar, transient and turbulent flows. Viscosity, compressible and incompressible flows. Differential equations of flow dynamics and heat mass transfer. Boundary layer evaluation and empirical relationships. Analytical and numerical methods for solving equations. Modelling and simulation methods. Empirical methods of heat exchange and flow mechanics.

**MRA253 Basics of Technical Design** (*graduate*)

2.00 CP (3.0 ECTS)

Marketing demands, fashion and style. The human potential and willingness to use a particular object (ergonomics). Technical aesthetics. Fundamental concepts of design: composition, form, colour. Laws of the design form development in the historic perspective.

**MSE432 Thermodynamics and Gas Dynamics** (*graduate*)

3.00 CP (4.5 ECTS)

The subject covers different thermodynamic systems and their characteristics. Energy transition types. Simple and complicated thermodynamic systems.

**MTM409 Technical System Vibration and Stability** (*graduate*)

4.00 CP (6.0 ECTS)

Composition of motion differential equations for technical systems. Stability of equilibrium. Vibration of linear discrete systems. Parametric vibrations. Stability. Free and forced vibration of rods, shafts, beams. Non-linear cases. Simple vibrations of discs plate and shells. Vibration of rotors. Stability.

**MMP510 Experimental Mechanics and Technical Diagnostics** (*graduate*)

4.00 CP (6.0 ECTS)

Reliability. Quality. Definition of testing. Functioning and monitoring diagnostics. Mathematical simulation of objects. Methods of measurement of parameters of testing object. Flaw detection and microscopy. Methods and means of diagnostics. Examples of diagnostic procedures: automobile transport, aircrafts, sea and river transport, railway transport, building engineering structures, technological machines.

**MTM411 Shock Theory** (*graduate*)

4.00 CP (6.0 ECTS)

Direct and oblique impact. Impact with rotation. Collision of two bodies. Restitution of impulse. Area of friction. Models with dissipated parameters. Effect of configuration of rod. Hydraulic impact. Impact against elastic beam. Impact in bodies system. Impact in constrained systems.

**MTH413 Fatigue and Damages of Materials of Mechanical Engineering Constructions** (*graduate*) 3.00 CP (4.5 ECTS)

Fatigue crack initiation at static and dynamic loads. Crack initiation at aggressive environment, contact corrosion. Thermal fatigue durability. Methods for understructure control of material. Experimental testing of fatigue, calculation of fatigue.

**MTH504 Numerical Analysis for Research of Dynamics of Machines (for Master Students)**

4.00 CP (6.0 ECTS)

This is the basic course on the use of numerical methods for the analysis and optimization of machine and mechanism dynamics. In the present field the researchers have to deal with complex problems of numerical mathematics, which demand the proficiency level above the average and is not limited to knowledge of the basic math course.

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