



**RIGA TECHNICAL
UNIVERSITY**

FACULTY OF TRANSPORT AND MECHANICAL ENGINEERING

Please note! This is a preliminary list of courses for the study year 2020/2021. Changes may occur!

AUTUMN 2020 BACHELOR COURSES

MMP343 Mechanics of Composite and Elastic Materials

2.00 CP (3.0 ECTS)

Classification of elastomers. Creep and relaxation. Mechanical models. Walter principle. Hysteresis. Creep phenomenon for metal structures. composite material properties. Reinforcement structures. Composites manufacturing technology. Stress approaches. Strength criteria. Material structure optimization.

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.

MTH206 Engineering Measurements and Experiments

2.00 CP (3.0 ECTS)

Experimental investigations in engineering. Methods and technical means for measuring physical and mechanical properties of materials (metals, composites). Measurements of dynamical parameters of mechanisms and structures (vibration, noise, temperature, pressure, flow, matter structure, concentration, force, velocity, acceleration). Types of experiments and plans. Automation of experimental investigations. Identification experiments. Methods for computer analysis and mathematical processing of experimental data.

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).

MTH306 Construction of Machines and Mechanisms

3.00 CP (4.5 ECTS)

Analysis and synthesis of mechanisms. Dynamics, models of dynamic calculation of machines and mechanisms. Principles of projection, planing and desing documentation, technology of assembling. Standartization in machine building. Exploitation reliability, life.

MTM326 Mechanical Vibration and Acoustics

3.00 CP (4.5 ECTS)

Free non-damped and damped oscillations. Excited vibrations. Systems with discreet parameters. Vibration of roads and beams. Parametric and auto vibrations. Elements of non-linear vibrations. Propagation of sound. Equations of gas dynamics. Waves propagation, reflection and absorption. Resonators.

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, hydraulical and thermal systems. Response of these systems to initial conditions, and to transient, steady and random inputs. Stability. Analysis of simple feedback systems.

MASTER COURSES

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.

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 introscopy. Methods and means of diagnostics. Examples of diagnostic procedures: automobile transport, aircrafts, sea and river transport, railway transport, building engineering structures, technological machines.

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.

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.

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.

MSE535 Non-Standard Sources of Energy (graduate)

3.00 CP (4.5 ECTS)

The subject gives basic knowledge in matters of non-standard and alternative energy sources, sustainable development theory, legislative acts and strategies on different levels that support and promote use of such energy sources and the modernization of utilization technologies. Huge attention is given to energy sources that have been used already for several centuries – solar, wind, running water (oceans, seas, rivers, tidal and ebb energy), biomass. The potential and the level of the utilization technology of every source is carefully evaluated according to technical, economic, environmental aspects. Emphasis is put on efficiency of energy conversion and total profitability. From the same aspects household and industrial waste, sludge from water treatment plants is considered. Interest is also built towards nuclear energy and hydrogen technologies. All sources are evaluated on the level of EU and the Republic of Latvia development plans.

MTH507 Lifting and Transporting Machines (graduate)

4.00 CP (6.0 ECTS)

Ways of transferring/shifting hard objects, liquids, loose and other materials, the physical and mechanical issues of their transfer. Designing and exploitation of the machines used in the agriculture, processing industries (mainly food, woodprocessing, construction materials) and service industries (mainly cargo transit, transport, seaport).

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.