



**RIGA TECHNICAL  
UNIVERSITY**

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

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

### **SPRING 2020 BACHELOR COURSES**

#### **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.

#### **MTH206 Engineering Measurements and Experiments**

2.00 CP (3.00 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.

#### **MSE304 Technical Thermodynamics and Heat Exchange**

3.00 CP (4.5 ECTS)

The subject deals with the problems of thermal processes in nature and technical equipment. Basic topics: thermodynamic systems - characteristics and parameters. Ideal and real gases. Basic laws of thermodynamics. Specific heat, internal energy, enthalpy, entropy, exergy. Thermodynamic processes and cycles. Water and water steam. Humid air. Gas and steam flows. Steam and gas cycles of thermal machines. Refrigerators and heat pumps. Mechanisms and heat transfer. Steady and unsteady heat conduction. Theory of similarity. Convective heat transfer. Thermal and velocity boundary layers. Complex heat transfer. Heat utilizing equipment. Design of heat exchangers.

#### **MRA322 Electronic Equipment of Production Automation**

3.00 CP (4.5 ECTS)

Functional equipment of discrete electronic automation. Methods and equipment of measuring physical parameters. Evolution of information signals and their prosessing. Schematics of control systems.

#### **MSE201 Heat Study**

2.00 CP (3.0 ECTS)

Subject gives an overview of the basic questions about liquid and gas flows and the most sufficient calculation model choice. Different kinds of flow are viewed and various processes in nature and machine industry fluid circuits are explained.

Subject explains how real fluid circuits work. Mostly pneumatic and hydraulic circuits for movement and force generating are overviewed. Components of these circuits are analyzed and properties of those components are viewed. Parameters and calculation principles of hydraulic circuits are shown. Hydraulic circuits for movement generation are analyzed.

#### **MMI101 Fluid Mechanics**

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.

## MASTER COURSES

### **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.

### **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.

### **MMP535 Fracture Theory** (*graduate*)

3.00 CP (4.5 ECTS)

Griffith ideas on cracks stability conditions. Irvin method. Stress concentration. Stress intensity factor. Fracture toughness. Energy methods: J-integral, strain energy release rate parameter, R-curve. Damagemechanics. Cracks and debonding in composites. Cyclic loading and de-bonding in composites. Cyclic loading and cracks propagation conditions.

### **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.