RIGA TECHNICAL UNIVERSITY

FACULTY OF MECHANICAL ENGINEERING, TRANSPORT AND AERONAUTICS

Please note! This is a preliminary list of courses for the study year 2018/2019. Changes may occur!

SPRING 2019

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.

MTM205 Engineering Mechanics Problems
3.00 CP (4.5 ECTS)
Use of theoretical laws and engineering methods for investigation of real typical systems. Role of chooses of a precision of calculation of model in a case of incomplete model parameter information. Tasks on static and dynamic loading and mechanical stresses. Problems of optimisation in a pneumatics and electromechanical systems.

MRA320 Methods and Technology of Process Control
3.00 CP (4.5 ECTS)
The essence and types of automation, models of control systems and their classification. Description of process control in different physical systems – mechanical, electrical, thermal, biological etc. Process control and analysis in continuous time and frequency domains. Computer control. Characteristics of discrete time control. Laplace and z-transforms. Process modeling by computers. Electronic control system equipment.

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.

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.

MTH302 Methodology and Technique of Design
3.00 CP (4.5 ECTS)
General concept of the main stages of design works. Formation and analysis of the consumer requirements as to the design of the object. Methods for designing the optimal machines and mechanisms. Design methods for increasing the strehgth and stiffness of typical machine elements. Unification and standardization in design works. Application of computer facilities in design works.

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.

MEE332 Medical Physics
3.00 CP (4.5 ECTS)
Conservation laws in biology; Metabolism; Human mechanics; Physics of vision; Physics of hearing; Biological membranes; Biopotentials; Biomedical measurements: conductivity; temperature; pressure; ionisinga and non-ionising radiation and its application in medicine.

MMK227 Fundamentals of Quality Control and Monitoring
3.00 CP (4.5 ECTS)
Basic concepts of quality. Quality management systems according to ISO 9001:2008 and special requirements for medical equipment manufacturing. Bodies involved in the activities related to conformity assessment, and assessment procedures. Types of audits and basic concepts. Methods and tools of quality assurance.

MEE712 Fundamentals of Physical and Mathematical Simulation
2.00 CP (3.00 ECTS)
Geometrical, physical and mathematical modeling methods and equipment will be considered. Student will be provided with competence in physical, mathematical and geometric modeling. Students will gain the skills to formulate tasks for modeling and modeling.

MEE710 Simulation of Physical Processes (Study Project)
2.00 CP (3.00 ECTS)
Principles of simulation. Geometrical simulation. Analogue simulation. Mathematical simulation. Network and optimization methods.

MEE404 Physical Materials Science
5.00 CP (7.5 ECTS)
Nature of atom bonds. Electrone structure of or ganic and nonorganicmaterial. Electron structure influence on material properties. Macro-and microproperties and their investigations.

MASTER COURSES

MMP539 Vibrotechnology and Vibromachines *(graduate)*
4.00 CP (6.0 ECTS)
Typical vibtotechnologies and machines. Fundamentals of the system. Nonlinear effects. Optimal design. Vibroisolation tasks. Optimal vibro-protection of machines and constructions. Complexes. Rotor dynamics. Design and calculations.

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, sees, 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.

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.

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.

MTM408 Optimization Methods *(graduate)*
4.00 CP (6.0 ECTS)
Extremes of analytic function. Extreme types. Minimum and maximum conditions of analytical function. General optimization problem formulation. Criteria and constraint types. Linear and nonlinear programming, the numerical methods. Gradient method. Local and global optimum. Universal and specialized optimization software. Functionals, the classical methods of functional minimization. Optimal control task standard form. Introduction to optimal control - Pontryagin maximum principle and dynamic programming. Introduction to multiobjective and robust optimization. In this course, students are not creating own optimization software codes, but will use specialized commercial software. Theoretical training target is to create the ability to formulate different optimization problems and use of commercial computer software for problem solution.

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.