SZENT ISTVÁN UNIVERSITY

FACULTY OF MECHANICAL ENGINEERING, GÖDÖLLŐ

ERASMUS COURSE CATALOGUE

2019/20 – 1st SEMESTER

LIST OF CORE COURSES

The Faculty of Mechanical Engineering of Szent István University is currently offering the below-listed core courses for the Autumn semester of the 2019/2020 academic year. Additional courses may be announced before the start of the semester, providing a wider range of courses to choose from.

Subjects from Bsc in Mechanical Engineering course

SUBJECT CODE	TITLE OF SUBJECT	SHORT DESCRIPTION	CREDIT	NAME OF SUBJECT TEACHER
SGTKJM001BN	**Introduction to Economics**		**3**	Dr. Farkasné Dr. Fekete Mária
SGMMAX17XXN	**Basics of mathematics**	**Weekly workload:** 2-4 hrs practical work **The aim of the subject**: to provide the knowledge needed by Mathematics I, in the frame of mathematical logic. Namely: Sets, polynomials. Linear equations and inequalities of one variable. Basic algebraic calculations, fractions. Quadratic equations and inequalities. Identities of exponentination. Calculating with square roots. Systems of equations and inequalities of higher ranks. Vectors, operations on vectors. Linear functions, power functions. Plotting functions and transformation of functions. Trigonometric functions. Fundamental trigonometric equations.	**0**	Kornélia Éva Dékány

		Subject outlines 1. Sets, polynomials. 2. Vectors, operations on vectors. 3. Linear equations and inequalities of one variable. 4. Basic algebraic calculations, fractions. 5. Quadratic equations and inequalities. 6. Identities of exponentination. 7. Calculating with square roots. 8. Systems of equations and inequalities of higher ranks. 9. Linear functions, power functions. 10. Plotting functions and transformation of functions. 11. Trigonometric functions. 12. Fundamental trigonometric equations. 13. **TEST (100 points).** **<u>Assessment</u>** The subject is successfully completed if the points scored in the final test are at least 51.		
SGMMCX02XXN	**Statics**	Purpose of this subject is examining rigid solids and giving a technical approach. Equilibrium of material point, static of rigid solids and static of plane and general structures is foreshown. It gives theoretical knowledge and helps practicing of the application methods. It discusses internal forces of beams and beam diagrams. At the end of semester frictional constraining contacts is discussed.	4	Dr. Katona Gábor
SGMJHX15XXN	**Fundamentals of Engineering**		**3**	Dr. Kiss Péter
SGMFFX14XXN	**Basics of Physics**	The subject aims to recap the main topics of the grammar school physics. The main topics are the mechanics of points, point systems and rigid bodies. The thermo-dynamics chapter deals with the thermal expansion, the calorymetry and ideal gases. The electrodynamics chapter consist of the physics of resting charges, the stationer electrical field and the DC circuits. The geometrical optics is the last chapter of the subject.	0	Dr. Víg Piroska

SGMFFX11XXN	**Physics I.**	The objective of the Physics I course is to base the subjects on the basis of the natural science approach. The subject describes the major laws of mass points, rigid bodies and deformable bodies mechanics by means of tertiary mathematics. The wavectomy is partly emphasized by the soundtrack. The thermodynamics section is described on the basis of phenomenological and statistical methods, through practical applications.	4	Dr. Seres István
SGMIFX30XXN	**Informatics I.**	This subject introduces the basic concepts of informatics and computer science. Topics include basics of the computer hardware; operating systems and file-management; essential knowledge of networks, the Internet and the WEB. This subject provides students with a hands-on introduction to the use of computers for word processing, computer graphics, presentation, surfing on the Internet, communicating via Internet, WEB-page design and spreadsheets. Students learn the usage of built-in functions of spreadsheet-editors, their application to matrix calculus and how to solve systems of linear equations and linear programming problems using spreadsheets.	3	Dr. Molnár Sándor
SGMMAX01XXN	**Mathematics I.**	The aim of the subject is to provide the knowledge needed by other subjects, in the frame of mathematical logic. Namely: Sets, relations, functions, functions on sets. Elements of mathematical logic. The set of real numbers; axioms and their consequences. Real-real functions. Continuity, limit, differentiation of real-real functions. Discussion of functions. Elementary real functions. Integration of real-real functions: definite and indefinite integral, integration methods.	6	Dr. Sebestyén Zoltán
SGMMCX24XXN	**Basics of Machine Design**	Geometric construction. Multiview projection. Views, sections. Sheet layouts. Lettering. Alphabet of lines. Dimensioning. Standardized representation. Drawing symbols. Threads, bolts and miscellaneous fasteners. Keys. Pins. Gears, gearings and gear drives. Rivets, riveting. Springs. Welded joints. Welding. Bearings. Bearing units. Shafts. Tolerances. Surface metrology.	3	Dr. Gyürk István

SGMMCX27XXN	**Dynamics**	Purpose of this subject is to present the mechanics of moving solids. It discusses kinematics and kinetics of material points, rigid solids and structures using knowledge of physics. During examining the structures it gives some knowledge in fundamental theories of mechanisms. Theory of vibrations is discussed apart chapter showed basic elements of that. Engineering practicing is enhanced.	5	Dr. Keppler István
SGMGSX15XXN	**Introduction to Machine Elements Design**	The course provides basic knowledge on designing elements of machines. The main objective is to develop in the junior mechanical engineering student the ability to analyse operational principles of different machine elements with special emphasis on their	3	Dr. Szendrő Péter
SGMMUM003BN	**Material handling and logistics**	The objectives of the course to introduce students into the theory and practice of material handlings machines (which are designed to move individual articles such as solids or free-flowing bulk mate-rials over a horizontal, inclined, declined, or vertical path of travel with continuous motion) and to give elementary knowledge to the design of these equipments. The course based on knowledge of Maths, Mechanics, Elements of Machines. In every topic operation, construction, application and design of the machine will be discussed. Examination requirements: written or oral exam **Topics** 1. Introduction of the Course, Basics of Material Handling 2. Material handling and logistics. Elements of Material Handling; Example on the performance of discontinuous handling systems 3. Belt Conveyor; Example on Belt Conveyor 4. Bucket Elevator; Example on Bucket Elevator 5. Scraper chain conveyor; Example on Scraper Chain Conveyor 6. Screw Conveyor; Example on Screw Conveyor 7. Transport Systems, Road-, Rail-, Sea-, Air-, Pipeline-transport; Practice: View of material handling machines in the TK building 8. Written Exam I.; Means of transport; 9. Project Week I 10. Machines of Warehousing; Example on Alternative Storage Systems Compensation of Written Exam II; 11. Continuous and discontinuous Conveyors;	**5**	Dr. Magó László

		Packages, Loading Units, and Load Carriers; Example on Conveying Capacity 12. Machines of Handling, and Picking Systems; Example on Storage Space Requirements 13. Inventory and Stock Management. Example on ABC-Analysis 14. Written Exam II *Literature:* Written and electronic material of the Presentations Requirements: Maximum reachable points due the Exams are 100 points, 25-25 points from the written exam at middle and at the end of the course on 7th - 14th week, and 50 points from the oral exam in exami-nation period. Minimum point from written exams is 13 points separately. Minimum point for the signature (recognition of a semester) are 26 points, which can be collect-ed from the written exams at middle and at the end of the course on 7th - 14th week. The oral exam is valid if the student can achieve 26 points. The final evaluation: 51 - 60 point mark - 2 61 - 75 point mark - 3 76 - 85 point mark - 4 86-100 point mark - 5		
SGMGSX14XXN	**Introduction to Computer Aided Design**	The objective of the subject is to acquaint students with computer aided 3 dimensional modelling techniques with the help of SolidEdge parametric design software. Beside the 3D model creation the students learn the methods of assembly techniques and to generate 2D technical drawings from the 3 dimensional models.	4	Dr. Szabó István
SGMGTX03XXN	**Materials**	Understand the basic laws of materials and metallography. Understand the important material testing procedures used in practice. The theoretical basics of heat treatment of materials and the most commonly used methods. The properties and markings of the most important structural and tool steels, cast iron castings, aluminum castings and copper alloys.	4	Dr. Szakál Zoltán

SGMETX25XXN	**Engineering Thermodynamics**	Methods and techniques of tem-perature measurement. Calculus of thermodynamic state parame-ters. Structure of the thermodynamic system. The main laws of the thermodynamics. State parameters. State chang-es of ideal gases. Active heat transport. Heat energy conservation into work through cycles. Carnot-cycle. Technical cycles I.Caloric state parameters. State-changes of ideal gases. Carnot cycle. Homework output<Technical cycles II. External combustion Engines, Compressors. Multiphase systems. Vapour diagrams and typical state changes of steams. Energy of moving gases.Calculus of theoretical thechnical cycles and compressors. Thermodynamics of steam machines. Theory and bal-ance equations of burning. Using of vapour diagrams. Calcu-lus of typical state changes of vapour.Thermodynamics of heat transport I. Conductivity, ra-diation. Calculus of steam engine cycles. Using of balance equations of burning. Thermodynamics of heat transport II. Convective and combined heat transport. Thermodynamic bases of heat exchangers. Calculus of heat transport and heat exchangers. Psychometric chart. Typical state changes of wet air. Drying kinetics. Cooling cycles. Energetic analysis of cooling cycles. Calculus of typical state ex-changes of wet air and drying process. Homework input. Project week. Calculus of cooling cycles.	4	Dr. Beke János
SGMMGX26XXN	**Applied Microeconomics**	The main objective of the course is to teach the fundamentals of applied micro-economics related to the management of the enterprises in a systematized form. The main chapters of the course: elements of micro-economics, basic formulas, resource management, finance and accountancy system of enterprises. After completing the course the students will be able to understand and solve the different managerial tasks of enterprises.	4	Dr. Daróczi Miklós
SGMMGX32XXN	**Quality Management**	The main objective is to teach the basic elements and connections of quality management scope to development of quality-culture and to build up a quality-philosophy. Topics: Means and importance of quality ? Cost of quality ? Designing for quality ? Cont	2	Dr. Husti István

SGMGTX13XXN	**Mechanical Engineering Technology**	The general laws of cutting. The theoretical and practical issues of the most important cutting technologies. Cutting tools. Construction, operation and control of machine tools. Devices' Functions and Design Basics. Designing Machining Technology for Typical Component Types. Action Planning. Brief description of integrated manufacturing systems. Programming numerical controlled machine tools, industrial robots. Structure of flexible manufacturing cells and manufacturing systems. Designing production processes. Individual, Type and Group Technologies. Computer-aided process planning. Design of tool movements. Human-machine connection tools. Data and knowledge base. The economy of machine manufacturing. Computer-integrated production.	5	Dr. Kári-Horváth Attila
SGMGET008BN	**Pneumatic and hydraulic energy transmission**	The subject discusses the most important details of fluid technology in hydrostatic and aerostatic approximation. In both cases, you will review the elements used and details of the construction, operation and testing of the circuits. In the field of hydraulics, it manages the solutions applied in vehicle technology and field machines (steering, traction drive, auxiliary drives, etc.) while in pneumatics it presents the industrial air supply, the foundations of vacuum technology and some catches of PLC control. Summarizes the automation found in pneumatics.	4	Dr. Jánosi László
SGMKOR004BN	**Environmental management and technology**	This module focuses on the technical-, economic-, and ecological foundations of relationship. For the mechanical engineers this subject presents the basically of ecology and the relationships between of ecological nature and social environment are discussed. The course, students learn about the global and regional economic development and growth problems, environmental impact, and their possible regulatory responsibilities to ensure harmony. The course introduces the operations and the processes that can be applied in environmental protection with emphasis on their technical background and equipment. The main parts of the subject are: mechanical-, hydrodynamic-, caloric- and mass transport operations and chemical- and biological processes.	5	Dr. Géczi Gábor

SGMJTX22XXN	**Polymer technology**	The course covers the following aspects of polymer physics and chemistry: Nomenclature, and fundamental concepts, Polymerization, Polymer ,stereochemistry, Polymers in solution, Characterization, Crystallinity and the glass transition, Rheological and mechanical properties including viscoelasticity, Copolymers, polymer blends and alloys, Processing	2	Dr. Kalácska Gábor
SGMJTX25XXN	**CAM practice**	Students learn about the principles and methods of computer modeling of mechanical systems that are of primary importance to practice. During the exercises, the fundamental features of modeling tools and models are studied. The subject is based on computer-based NC technology design based on modeling, tool design and other engineering design based on modeling methods, computer-led manufacturing, and model analysis. With the knowledge gained, the student will be able to know and apply without any difficulties during later studies and professional practice of the student modern modeling tool.	2	Dr. Keresztes Róbert Zsolt
SGMJTX26XXN	**Programming of modern machine tools**		**2**	Dr. Keresztes Róbert
SGMMHX31XXN	**Tribology**	It includes the study and application of the principles of friction, lubrication and wear.	2	Dr. Zsidai László
SGMGTX24XXN	**CAE Practice III.**	The aim of the course is to acquire the correct design basics for different molding tools and to familiarize the practical application of different tooling structures, and to apply design knowledge in the CAD / CAE system. From the product model, virtual design, optimization (eg injection molding simulation) of the complete molding tool, as well as the utilization of the widely used tool normalities in practice. Generate models for rapid prototype production.	2	Dr. Pataki Tamás István

Subjects from Msc in Mechanical Engineering course

1st semester subjects
3rd semester subjects

SUBJECT CODE	TITLE OF SUBJECT	SHORT DESCRIPTION	CREDIT	NAME OF SUBJECT TEACHER
SGMMAX01XMN	**Mathematics III.**	**Short description:** Building upon the preceding mathematical courses, the subject provides various supplementary tools necessary for studying and modelling different technical problems. Namely: Double and triple integrals; theory of spatial curves; line and surface integrals; integral theorems; ordinary differential equations; systems of differential equations; basics of partial differential equations. Fourier series.	6	Dr. Sebestyén Zoltán
SGMFFX01XMN	**Physics for Engineers**	Building upon the preceding physical courses, the subject provides more profound presentation of the classical-, and quantum physics at a contemporary level. various supplementary tools necessary for studying and modelling different technical problems. The course provides a comprehensive overview of basic principles of the classical mechanics and thermodynamics with statistical mechanics, electrodynamics and foundations of quantum mechanics, too. The content of the complete course is summarized concisely below: • Mathematical introduction: on the elements of tensor algebra and vector analysis calculus. - Fundamental concepts and simple operations - The physical meaning of gradient-, divergence- and rotation operations - Symmetric and antisymmetric tensors and their products • Foundations of classical mechanics: kinematics, Newton’s laws and foundations of dynamics. • Elements of particle dynamics, including detailed analysis of the problem of harmonic oscillators, and relevance of the dissipative	2	Dr. Mészáros Csaba

		forces with examples with emphasis on the classical problem of the damped harmonic oscillator. • Motion of rigid bodies and Steiner’s law. • General treatment of the basic conservation laws of mechanics: energy-, impulse and moment of impulse with examples. • Foundations of fluid mechanics - Introduction: some basic results from the static fluid systems with examples with applications of Torriceli’s law. - Some simple examples of applications of the Bernoulli’s and continuity equations. - Basic mathematical features of general balance equations. The concept of local-, and substantial balances with some simple examples. • The Navier-Stokes equation, as the most important general equation of motion of hydrodynamics in the case of the viscous fluid flow with some simple applications. • Foundations of the mechanics of dissipative continua (including both fluid dynamics and elasticity theory). The Stokes’ law with some simple applications. The motion of a spherical particle in viscous fluids at rest (detailed solution of the relevant first-order ordinary differential equation). The Hagen-Poiseuille’s law with applications. A concise presentation of the boundary layer phenomena relevant for engineering applications. • Relevance of the heat expansion phenomena in solids and fluid systems with some simple applications. • Instability mechanisms and role of control parameters: relevance of the Reynolds’ and Rayleigh’s numbers at turbulent and convective flow instability phenomena. • Foundations of the theory of coupled transport processes taking place in		

		macroscopic dissipative continua, with some simple applications. Relevance of the Onsager-reciprocal relations. Manifestation of the Duffour-, and Soret-effects at drying processes. • The basic characteristics of ideal gases and Clapeyron’s equation. Real gases and the van der Waals equation. • The first law of thermodynamics. • Adiabatic processes and Poisson’s law. • Derivation of the formulae of the isothermal and adiabatic work processes. • The Carnot-cycle and its efficiency. • The second law of thermodynamics. • The concept of entropy and its interpretation according to the statistical mechanics • Foundations of electrostatics and Coulomb’s law (with examples). • Direct currents and characteristics of Drude’s model of electrical conductivity of metals. Ohm’s law and Kirchoff’s laws. • Magnetic fields of the direct currents and the Biot-Savart’s law. • Phenomenon of the electromagnetic induction; Lenz’s law. The Faraday’s law of induction. • The Lorentz-law (with examples). • Foundations of the contemporary electrodynamics: relevance of the Maxwell’s theory in classical describing of the electromagnetic phenomena. • The electromagnetic waves: derivation of the wave equation. The Poynting’s vector. • Foundations of the physical optics: the interference-, diffraction- and polarisation of light waves. The conditions of coherence and crucial importance of the Fresnel-Young experiment. • Thermal emission and radiation laws of the black body.		

		• Foundations of quantum mechanics: Negative results of the Rayleigh-Jeans theory and the crisis of the classical physics. • Foundations of Planck’s quantum theory. Discrete atomic spectra and essential features of the Bohr’s atomic model. • The wave-particle dualism according to the theory of de Broglie’s theory. The uncertainty principle of Heisenberg. • Schrödinger’s equation with simple applications. Foundations of the contemporary solid state physics: the motion of an electron in the periodic potential field of a crystal lattice. *Recommended literature*: The relevant parts from the following textbooks: Feynman, R.P.-Leighton, R.B.-Sands, M.: The Feynman Lectures on Physics, Vol. 1.-3., 2nd Ed. Addison-Wesley (2005) Scheck F.: Mechanics (Graduate Texts in Physics) (Springer-Verlag Berlin Heidelberg 1988, 1990, 1992, 1994, 1996, 1999, 2003, 2007) (ISBN: 978-3-642-05369-6 (Print) 978-3-642-05370-2 (Online)) Durst F.: Fluid Mechanics (Graduate Texts in Physics) (Springer-Verlag Berlin Heidelberg, 2008) Greiner W.: Quantum Mechanics (An Introduction) (Springer-Verlag Berlin Heidelberg, 2001) ISBN 978-3-642-56826-8		
SGMMCX06XMN	**Elasticity**	Based on BSc-level mechanics, the course deals with flexibility, undefined structures and some special mechanical issues. Presentation of the curriculum in full-time lectures (2 hours / week), and exercises (2 hours / week), in the form of compulsory and optional sessions in correspondence classes, and optional consultations are held every day at the published time.	4	Dr. Oldal István

SGMGSX07XMN	**Machine Construction and Design**	The course reviews and summarizes the basic concepts of food industry operation as follows. The structure of the food economy; food legislation; food safety and quality, quality assurance and control; materials, products and energies for processing; processing operations, procedures, processes and technologies; preservation, packaging and storage of foodstuffs; establishment and operation of a processing plant.	3	Dr. Kátai László
SGMGTX01XMN	**Engineering Material**	To get to know the basic regularity of material – structures and metallography. To get to know the important material testing processes used in practice. The theoretical basis of heat treatment of materials and the most often used processes. The properties and the standard symbols of the most important constructional and tool – steels, aluminium and copper alloys.	4	Dr. Kalácska Gábor, Dr. Szakál Zoltán
SGMMGX01XMN	**Engineering Economics**	The main goal of the subject is to teach the microeconomic knowledge of the business management in a systematic way. The main chapters of the thesis are: basic concepts, basics, business resource management, financial and accounting systems. With this knowledge, students are able to see the most important business management tasks of companies.	3	Dr. Daróczi Miklós
SGMFFX02XMN	**Computer Simulation**	The aim of the course is to introduce the development of physical based mathematical models using examples from engineering practice. Then computational realization and solution of mathematical models of dynamical systems in interactive graphical simulation environment. Measurement based identification of model parameters and model validation. The topics of the main case studies: thermal behavior of electrical engines, modeling and simulation of environmental meteorological parameters, modeling and simulation of flat plate collector and a solar hot water system.	4	Dr. Farkas István
SGMMHX01XMN	**Automation Engineering**	An Introduction first defines and organizes the key elements of mechatronics, exploring design approach, system interfacing, instrumentation, control systems, and microprocessor-based controllers and microelectronics. It then surveys physical system modeling, introducing MEMS along with modeling and simulation. Coverage then moves to essential elements of sensors and actuators, including characteristics and fundamentals of time and frequency,	4	Dr. Jánosi László

		followed by control systems and subsystems, computer hardware, logic, system interfaces, communication and computer networking, data acquisition, and computer-based instrumentation systems. The subject consists of 2 hours lecture and 1 hour laboratory practice on every week. Topics: • Introduction to Mechatronics • What is Mechatronics? Development of Mechatronics • Home work discussion. Selection of topic of report • Literature research. Literature sources. How to find the relevant sources? • Key elements of Mechatronics. Integration and synergy in mechatronics • Industry 4.0. Agromechatronics • Energy transmission in Mechatronics. Pneumatic Drives • Energy transmission in Mechatronics. Hydraulic energy transmission • Geografical Positioning System • Automation in vehicle technics • Summary, consultation • Written test		
SGMGSX08XMN	**Theories of Technical Development**	The aim of the subject is to acquaint students with the content and theory of development and planning activities and also to give a complex technical and economical approach concerning to the realization of development and design processes. **2 lectures and 1 seminar**/week, time schedule and venue is given in the Neptun timatable. *Required literature* Charles S Wasson: System Analysis, Design and Development, John Wiley & Sons 2006. ISBN-13 978-0-471-39333-7.	4	Dr. Kátai László