ENGINEERING
Autumn 2020

Course title	ECTS	Degree	Course code	Prerequisites	Subject area
Ergonomics	3	Bachelor	T500B102	No requested	Security Technology
Mechanics of Material	6	Bachelor	T210B011	Applied mathematics, Statics and kinematics, Dynamics, applied physics	Mechanical Engineering
Computer-aided Design 1	6	Bachelor	T210B104	Engineering Graphics, Physics, Computerised Drawing	Mechanical Engineering
Technological Equipment	6	Bachelor	T210B220	Details of machines. Constructional materials. Resistance of materials. The schedule for engineer	Mechanical Engineering
Quality Management	3	Bachelor	T130B109	No requested	Manufacturing Technology
Introduction to Robotics	3	Bachelor	T125B120	No requested	Automation, robotics, control engineering
Fundamentals of Electronics and Circuits	5	Bachelor	T170B013	Physics	Electronics
Image Processing	6	Master	T121M100	Digital Signal Processing	Electronics

Subject area: **Security Technology**

Status	Course code: T500B102 Course title: **ERGONOMICS** Taught by: Assoc. Prof. Dr. Dalia Čikotienė		
Semester	**ECTS credits**	**Languages**	**Duration**
Autumn	3	English	1 semester
Study hours	**Assessment**	**Prerequisites**	**Examination**
Lectures – 16 h Laboratory work – 16 h Self-study – 48 h Total – 80 h	10-point scale	-	Mid-term examination – 30% Laboratory work – 20% Final examination – 50%

Subject content	Conception of ergonomics. System "Human-equipment-environment". Aims and methods of ergonomics. Composition and structure of ergonomics. Anthropometry. Sight. Hearing. Sensations of the body. Speech. Psyche features of human. Work physiology. Professional overload. Working tools. Work in sitting position. Work standing. Work in movement. Controlling of the system "human-equipment-environment". Designing of working environment. Microclimate. Chemical environment. Prophylactics of negative influence of microclimate and chemical environment. Illumination. Noise. Vibration. Electromagnetic emission. Ergonomics of computer-aided systems. Working place according to ergonomics requirements.
Learning Outcomes	Knowledge about conception of ergonomics, aims and methods, composition and structure of ergonomics. Main knowledge about anthropometry, psycho physiological possibilities of human, psyche features of human, work physiology. Designing of working environment for better working conditions is discussed. Pecularities of computer-aided systems and ergonomics requirements in these places are discussed.
Literature	1. R. S. Bridger. Introduction to ergonomics. United Kingdom, 2009, 776p. 2. Ergonomics for Beginners: A Quick Reference Guide, Third Edition Published:May 28, 2008 by CRC Press - 160p. Authored By:Jan Dul. 3. Human Factors for the Design, Operation, and Maintenance of Mining Equipment. Tim John Horberry, Robin Burgess-Limerick, Lisa J. Steiner. Publisher: CRC Press; 1 edition. 2010.

Subject area: **Mechanical Engineering**

Status	Course code: T210B011

	Course title: **MECHANICS OF MATERIAL** Taught by: Assoc. Prof. Dr. Artūras Sabaliauskas		
Semester	**ECTS credits**	**Languages**	**Duration**
Autumn	6	English	1 semester
Study hours	**Assessment**	**Prerequisites**	**Examination**
Lectures – 32 h Practical work – 32h Laboratory work – 16 h Self-study – 80 h Total – 160 h	10-point scale	Applied mathematic, Statics and kinematics, Dynamics, applied physics	Mid-term examination – 10% Laboratory work – 5% Control work – 20% Homework – 15% Final examination – 50%

Subject content	Taught to evaluate the mechanical behavior of materials under stress and strain. Stress and strain. Axial deformation. Torsion. Shear stress. Pure bending.
Learning Outcomes	To know to evaluate the stress and strain state in all load conditions. To able to assess the strength of reserve stretching, bending and twisting. To able to analyze the stresses and strains, determine the relationship between various elements of calculated cross-sections. Knowledge and understanding of materials behavior in short-term and possible long-term load cases. To be able to assess and determine the material strength, plasticity, elasticity, hardness, and their characteristics
Literature	1. Vitor Dias da Silva. Mechanics and strength of materials. Springer Berlin Heidelberg New York, 2006. – 531p.

Subject area: **Mechanical Engineering**

Status	Course code: T210B104 Course title: **COMPUTER-AIDED DESIGN 1** Taught by: Assoc. Prof. Dr. Sergėjus Rimovskis		
Semester	**ECTS credits**	**Languages**	**Duration**
Spring	6	English	1 semester
Study hours	**Assessment**	**Prerequisites**	**Examination**
Lectures – 16 h Laboratory work – 64 h Self-study – 80 h Total – 160 h	10-point scale	Engineering Graphics, Physics, Computerised Drawing	Homework – 20% Laboratory work – 20% Homework – 10% Final examination – 50%

Subject content	The systems of computer aided design of mechanical objects. Sketch drawings and their fixing by geometrical constraints and dimensions. The main means for part designing: extruding, revolving, shells and others. Work planes, lines and points. Placed features and their application. Layout and printing of drawing views, detail views, broken views and sections.Assembly drawing, their contraints, part lists and baloons. Basics of parametric design. Solution of engineering tasks using SolidWorks means.
Learning Outcomes	Knowledge about designing, modeling, manufacturing methods and ways. Information about technical means used and their management methods. Abilities to apply professional knowledge when solving tasks of known and unknown profile, having limited and contradictory information only. Skills of using information technologies, base software, abilities to apply and use digital computer means to solve specific problems, use computers to get and process the data of problems solution, to operate processes and computer aided design. Ability to apply the motion laws of mechanical systems, the principles of stability and reliability to create the technical means, improve and correct. Skills of information technologies use, for example, using information sites and data bases, preparing computerized textual and graphic information.
Literature	SolidWorks. Getting started Exercises. SplidWorks. User's Guide.

Subject area: **Mechanical Engineering**

Status	Course code: T210B220 Course title: **TECHNOLOGICAL EQUIPMENT** Taught by: Lect. Vitalijus Skačkovas		
Semester	**ECTS credits**	**Languages**	**Duration**
Autumn	6	English, Russian	1 semester
Study hours	**Assessment**	**Prerequisites**	**Examination**
Lectures – 48 h Laboratory work – 16 h Practical work – 32 h Self-study – 64 h Total – 160 h	10-point scale	Details of machines. Constructional materials. Resistance of materials. The schedule for engineer.	Mid-term examination – 10% Laboratory work – 20% Practical work – 25% Final examination – 45%

Subject content	Acquire technological equipment work programming framework knows various metal-cutting machine tools, working principles, is able to select various technology production facilities and equipment. Getting to know the technological equipment, the equipment, mechanisms, range of applications, technological possibilities, harmonize universal knowledge of metal-cutting equipment, able to create control programs and acquire the fundamentals of management, are aware of the special programs used in the management of technological equipment. Know the design of technological equipment, machinery, equipment, function, principles of operation.
Learning Outcomes	Competences ability of the numerical control programs, pay and manage to combine universal technological equipment. Acquire technological equipment work programming framework knows various metal-cutting machine tools, working principles, is able to select various technology production facilities and equipment. Getting to know the technological equipment, the equipment, mechanisms, range of applications, technological possibilities, harmonize universal knowledge of metal-cutting equipment, able to create control programs and acquire the fundamentals of management, are aware of the special programs used in the management of technological equipment. Know the design of technological equipment, machinery, equipment, function, principles of operation.
Literature	1. Virtual reality CNC Turning for Windows Users Manual, UK 2005. 2. Virtual reality CNC Milling for windows Users manual, UK 2005. 3. MasterCAM 9.1 Lathe Tutorial (Metric version). 2002 CNC Software, Inc., 290 p. 4. MasterCAM 9.1 Mill/Design Tutorial (Metric version). 2002 CNC Software, Inc., 442 p. 5. CNC Programing Handbook Peter Smid, second Edition. 6. Edgecam 2018 R1 (verosoftware), mill/design tutorial (metric version). 7. Modern digital processing center processing centers and their programming. I d Machining centers. A.H.Marcinkevicius, V.Makshin, M.Jurevičius, Vilnius, Technics, 2010. 8. Technological equipment. Part I Metal Cutting Machine. Z. Ramonas, V. Skačkovas. Educational book, Šiauliai 2015. 9. Mechanical processing of software controls. S.Baskutis et al., Kaunas, 2016. UDK 621.7 (075.8) Me-15.

Subject area: **Manufacturing Technology**

Status	Course code: T130B109 Course title: **QUALITY MANAGEMENT** Taught by: Assoc. Prof. Dr. Dalia Čikotienė		
Semester	**ECTS credits**	**Languages**	**Duration**
Autumn	3	English	1 semester
Study hours	**Assessment**	**Prerequisites**	**Examination**
Lectures – 16 h Laboratory work – 16 h Self-study – 48 h Total – 80 h	10-point scale	-	Mid-term examination – 20% Paper – 10% Homework – 30% Final examination – 40%

Subject content	Requirements for the quality product, the importance and benefit of quality warranty, standards for the quality management are introduced. Distinguishing of the product quality prevention, quality evaluation, internal and external losses concerning non quality of the product are examined. Training to evaluate the main principles of the designing, which can secure quality of the product is performed. Evaluation of the quality seeking cost is performed. Importance and practical meaning of the product quality prevention and appraisal are proved.
Learning Outcomes	Formulation of the requirements for the quality product are acquired. Knowledge of the estimation of the product quality are learned. Standards of the quality management are introduced, the practice use of them is acquired. Knowledge about what the product quality is reliant on are acquired. Factors which have influence on the quality warranty and for the cost of the quality seeking are examined. Knowledge about requirements of the customers are achieved. The main principles of the quality product design are examined. Quality cost of the product are evaluated.
Literature	1. The management and control of quality / James R. Evans, William M. Lindsay. Australia : South-Western, 2011.-743p. 2. Managing quality / Barrie G. Dale, Ton van der Wiele and Jos van Iwaarden. Malden (Mass.) : Blackwell, 2007. 610 p. 3. Succeed with productivity and quality : how to do better with less / Imre Bernolak. ASQ Quality Press, USA, 2009. 241 p.

Subject area Automation, robotics, control engineering

Status	Course code: T125B120 Course title: **INTRODUCTION TO ROBOTICS** Taught by: dr. Dainius Balbonas

Semester	ECTS credits	Languages	Duration
Autumn	5	English	1 semester
Study hours	**Assessment**	**Prerequisites**	**Examination**
Lectures – 16 h Laboratory class – 8 h Practical class -8h Consultation 4 h Self-study – 44 h	10-point scale	-	Problem-solving task 50% Final examination – 50%

Subject content	Introduction Overview of robots Mechanical and electrical parts Robot communication interfaces Programming robot using ON-Line method Programming robot using OFF-Line method Robot Programming Features in Manufacturing Processes
Learning Outcomes	Knowledge about main components of a robot and operating principles. Identify factors which should be considered when selecting a robot Get acquainted with different methods of programming industrial robots. Gain skills of ON-Line programming method of industrial robot. Be able to model robotic production processes using OLP software packages. Be able to design a robotized workplace in a virtual environment.
Literature	R. Towers, L. Ross, J. Masterson, S. Fardo. Robotics: Theory and Industrial Applications. 2010. Goodheart-Wilcox Publisher. ISBN-10: 1605253219 L. K. Huat. Industrial Robotics: Programming, Simulation and Applications. 2006. Pro Literatur Verlag, Germany / ARS, Austria. ISBN 3-86611-286-6 OTC Almega FD series manuals. (*electronic copy)* Sergejs Ločs, Pāvels Drozdovs. Maintenance of Industrial Robot. Learning Materials. (*electronic copy)* Andrejs Radionovs, Vasīlijs Šilovs, Andris Vagalis. Programming of Industrial Robots. Learning Materials. (*electronic copy)* D. Balbonas, E. Bielskis. Robot Maitenance. Learning Materials. (*electronic copy)*

Subject area Electronics

Status	Course code: T170B013 Course title: **FUNDAMENTALS OF ELECTRONICS AND CIRCUITS** Taught by: dr. Dainius Balbonas

Semester	ECTS credits	Languages	Duration
Autumn	5	English	1 semester
Study hours	**Assessment**	**Prerequisites**	**Examination**
Lectures – 32 h Laboratory class –32 h Consultation 8 h Self-study – 61 h	10-point scale	-	Mid-term examination – 25% Homework – 15 % Laboratory work – 20% Final examination – 40%

Subject content	Introduction to electronics. Electric circuits. Passive circuit elements Main laws of circuit theory. DC and AC circuits Circuit analysis methods Transient analysis Semiconductors and PN junction Diodes Bipolar transistors (NPN, PNP) Field effect transistors (JFET, MOSFET) Thyristors Optoelectronic devices Application of electronic components and circuits
Learning Outcomes	Knowledge and application of mathematical apparatus required for electronic circuit analysis. Knowledge and application of the laws of circuit theory. Is able to calculate the circuit parameters using mathematical knowledge, laws and analysis methods of circuit theory. Understanding of electronic circuits and knowledge how to draw electronic circuits. According to circuit parameters is able to choose circuit elements. Ability to use laboratory equipment. Ability to monitor and evaluate the electrical phenomena in the circuits. Theoretical knowledge effectively applied in practice, for selection circuit elements and calculation parameters of circuits. Knowledge about passive circuits elements, semiconductors and PN junction and abilities to use them in practice Knowledge about semiconductor diodes, bipolar and field effect transistors and their parameters and abilities to use them in practice. Knowledge about optoelectronic devices
Literature	Štaras S. Semiconductor electronic devices : study book. Vilnius: Technika, 2010. Brindley K. Starting electronics. Oxford ; Waltham, MA : Elsevier/Newnes, 2011. (*electronic book)* Wilson, P. The circuit designer's companion. Oxford : Newnes, 2011. (*electronic book)* Kwok K. Complete guide to semiconductor devices. IEEE Press, 2002. AspenCore, Inc. Internet source https://www.electronics-tutorials.ws/

Subject area: **Electronics**

Status	Course code: T121M100 Course title: **IMAGE PROCESSING** Taught by: Assoc. Prof. Dr. Donatas Dervinis		
Semester	**ECTS credits**	**Languages**	**Duration**
Autumn	6	English	1 semester
Study hours	**Assessment**	**Prerequisites**	**Examination**
Lectures – 32 h Laboratory – 32 h Self-study – 96 h	10-point scale	Digital Signal Processing	Individual work – 40% Final examination – 60 %

Subject content	In course is created from different theme about image processing, transformation and saving. Colour system. Statistical operations. Multi-image operations. Spatial operations and transformations, template, convolution, edge detection, correlation, segmentation. Morphological and other area operations. Finding basic shapes. Object recognition. Image compression. Image reconstruction. Processing of video sequences.
Learning Outcomes	Knowledge about main methods of digital image processing, abilities for using image processing programmes.
Literature	Rafael C Gonzalez. Digital Image Processing 3rd Edition, 2014 John C. Russ and F. Brent Neal The Image Processing Handbook, Seventh Edition 2015 Alasdair McAndrew. A Computational Introduction to Digital Image Processing, 2015