RĒZEKNES TEHNOLOĢIJU AKADĒMIJA

RESEARCH
&
INNOVATION

2020 - 2021

Main research areas covered by Rezekne Academy of Technologies lie in the fields of engineering, humanities, and social sciences. Applied and experimental research projects are based on principles of interdisciplinarity, integrity, and knowledge transfer. Regional, national, and international research collaborations provide significant contribution to development of knowledge society.

Professor, Dr.oec. Iveta Mietule

Rector of Rezekne Academy of Technologies

REZEKNE ACADEMY OF TECHNOLOGIES

Traditions of higher education since 1925.

The 6th largest state founded higher education institution in Latvia (according to the number of students).

64% of the academic staff hold doctoral degree.

More than 200 bilateral cooperation agreements with universities and organizations from more than 40 countries.

Founder of Eastern Latvia Secondary School of Technologies (STEM-oriented education), established in 2015.

RTA - the centre of regional development where human resources and infrastructure are concentrated, so all the subjects of innovation system – education, science and entrepreneurship – could develop the following PRIORITY BRANCHES:

ENGINEERING & TECHNOLOGY

Technologies, materials and engineering systems for the increasing of the added value of products and processes.

Exploration and sustainable use of the local natural resources for the development of knowledge-based bio-economy.

HUMANITIES

Latgale region`s languages and cultures research in the context of Latvia and Europe.

Transformation of the Latgalian language and culture in the 21st century.

ICT in humanities.

Multilingualism, language policy and governance in the local, national, and international context.

THE LEADING TECHNOLOGY CENTRE IN EASTERN LATVIA

SOCIAL SCIENCES

Economic space
and systems research.

Public and border security,
management, and protection.

Entrepreneurship and
resources management.

Theoretical and practical
issues in jurisprudence.

Information and
communication research
(history, social memory,
media consumption, social
networks, and users).

EDUCATIONAL SCIENCES

Development of therapies,
development and introduction
of rehabilitation technology,
preventive strategies and
measures.

Inclusion technologies in
education, socialization
and resocialization
strategies.

Communication in
education
and digital environment.

Support technologies
for social risk families.

STUDY FIELDS:

- Economics
- Information and Communication Science
- Internal Security and Civil Protection
- Law Science
- Management, Administration and Real Estate Management

  More information:
  https://www.rta.lv/economics_and_management_faculty

- Arts
- Education, Pedagogy, and Sports
- Translation
- Social Welfare

  More information:
  https://www.rta.lv/education_languages
  _and_design_faculty

- Architecture and Construction
- Information Technologies, Computer Engineering, Electronics, Telecommunications, Computer Management and Computer Science
- Mechanics and Metalworking, Heat Power Industry, Heat Engineering and Mechanical Engineering
- Production and Processing
  More information: https://www.rta.lv/engineering_faculty

FACULTY OF ECONOMICS AND MANAGEMENT
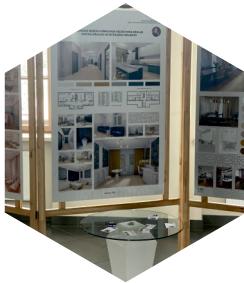
FACULTY OF EDUCATION, LANGUAGES, AND DESIGN

FACULTY OF ENGINEERING

JOINT STUDY PROGRAMMES:
IN COLLABORATION WITH LATVIAN UNIVERSITIES

Doctoral study programme
SOCIOTECHNICAL SYSTEMS MODELLING

in collaboration with Vidzeme University of Applied Sciences

Doctoral study programme
EDUCATION SCIENCES

in collaboration with the University of Latvia, Liepaja University, Daugavpils University

Doctoral study programme
ECONOMICS AND BUSINESS

in collaboration with Vidzeme University of Applied Sciences, Ventspils University of Applied Sciences

IN COLLABORATION WITH FOREIGN UNIVERSITIES

Bachelor`s study programme

SOCIAL WORK AND SOCIAL REHABILITATION

in collaboration with Siauliai University (Lithuania)

Master study programme

LASER TECHNOLOGIES

in collaboration with Mittweida University of Applied Sciences (Germany)

Doctoral study programme

LASER TECHNOLOGIES

in collaboration with the Angel Kanchev University of Ruse (Bulgaria)

European Joint Master`s in

STRATEGIC BORDER MANAGEMENT

developed by FRONTEX in collaboration with several European universities and academies

RESEARCH INSTITUTES

RESEARCH INSTITUTE FOR BUSINESS AND SOCIAL PROCESSES

Faculty of Economics and Management

Contacts: anda.zvaigzne@rta.lv
sandra.sprudzane@rta.lv

RESEARCH INSTITUTE FOR REGIONAL STUDIES

Faculty of Education, Languages and Design

Contacts: velta.lubkina@rta.lv
sanita.martena@rta.lv

INSTITUTE OF ENGINEERING

Faculty of Engineering

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edmunds.teirumnieks@rta.lv

SCIENCE COMMUNICATION
International Conferences

"Personality. Time. Communication" – student conference, organised by the Faculty of Education, Languages and Design aims to promote students' abilities to conduct research and explore novelties in the field of partnership. Education, art, design, translation and social welfare students interested in new methods of research and practical work are invited to join the conference and present their research papers.

"Society. Integration. Education" – academic conference is organized by the Faculty of Education, Languages and Design in cooperation with Rīga Stradiņš University (Latvia), Klaipeda University (Lithuania), Bialystok University of Technology (Poland), and Institute of Pedagogy of the Nation Academy of Education Sciences of Ukraine. The aim of this conference is to provide the platform for researchers to share the knowledge and ideas in the recent trends in such disciplines as higher education, pedagogy, lifelong learning, health and sports, information technologies in education etc.

"Human. Environment. Technology" – academic and practical conference is organized by the Faculty of Engineering within the framework of Engineering Days. The participants of the conference work in a number of sessions, such as "Environmental Protection", "Engineering, Production and Logistics", "Production Technologies", "Information Communication Technology", "Construction" presenting their studies and sharing knowledge and experiences.

Organised in collaboration with the State Border Guard College, the academic and practical conference **"Border Security and Management"** aims to provide the platform for researchers to share the knowledge and ideas in the recent trends in border security and management areas.

Student and teacher academic and practical conference **"Individual. Society. State"** is organised by the Faculty of Economics and Management in collaboration with Polotsk State University (Belarus), Utena University of Applied Sciences (Lithuania), and Kaunas University of Applied Sciences (Lithuania). The aim of the conference is to boost theoretical and practical exchange of views on topical issues related to entrepreneurship, economics, international co-operation, law, archival science, applied history and regional studies.

"Environment. Technology. Resources" – scientific conference organised by Faculty of Engineering aims to provide the platform for researchers to share the knowledge and ideas in the recent trends in the following disciplines: enviroment and resources, information technologies, engineering sciences and production technologies, and engineering education, etc.

More information – https://conferences.rta.lv/

European Researchers' Night

Due to restrictions to reduce the spread of Covid-19 disease in Latvia, the European Researchers' Night planned for autumn 2020 was postponed to April 30, 2021 and took place online. RTA offered various activities with the aim to give an idea of what has been done in the field of research. Innovative solutions were showed an attractive way; the results of various projects were presented.

Open Access Publications (journals.rta.lv)

JOURNALS:

- Administrative and Criminal Justice;
- Border Security and Management;
- Education Reform in Comprehensive School;
- Education Content Research and Implementation Problems;
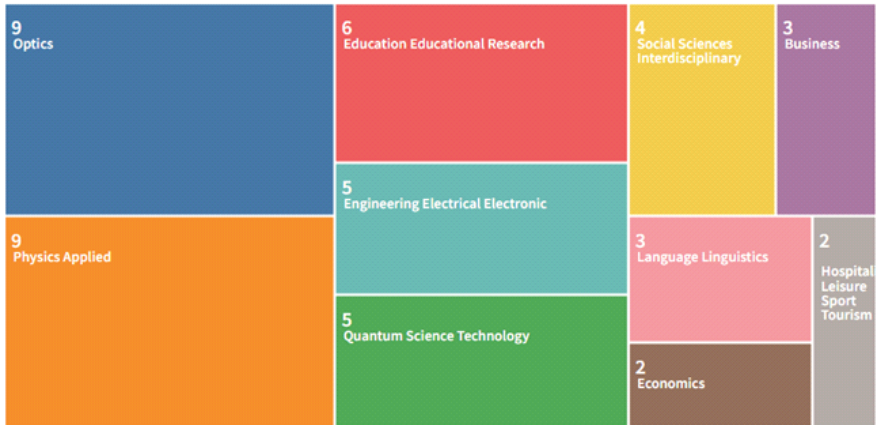- Journal of Regional Economic and Social Development;
- Via Latgalica.

PROCEEDINGS OF INTERNATIONAL ACADEMIC CONFERENCES:

- Environment. Technology. Resources;
- Human. Environment. Technology;
- Individual. Society. State;
- Society. Integration. Education.

OPEN ACCESS BOOKS AND MONOGRAPHS (books.rta.lv)
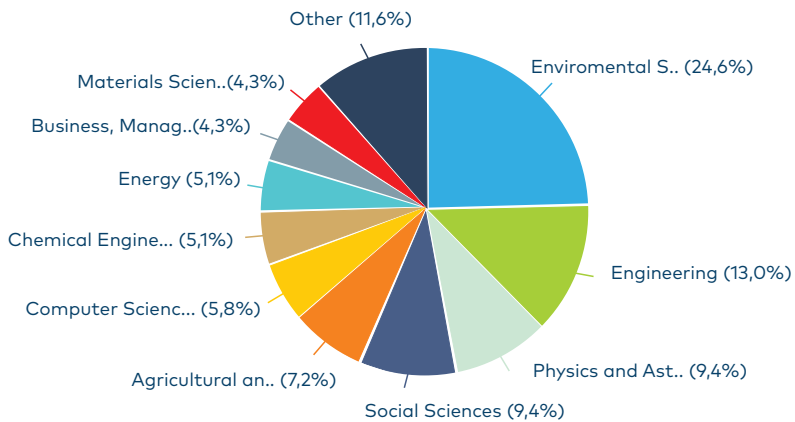
PUBLICATIONS
Web of Science (2020-2021)

9 Optics	**6** Education Educational Research	**4** Social Sciences Interdisciplinary	**3** Business
	5 Engineering Electrical Electronic	**3** Language Linguistics	**2** Hospital Leisure Sport Tourism
9 Physics Applied	**5** Quantum Science Technology	**2** Economics	

Source: https://www.webofscience.com

SCOPUS
(2020-2021), 79 document results

Documents by subject area

- Other (11,6%)
- Materials Scien..(4,3%)
- Business, Manag..(4,3%)
- Energy (5,1%)
- Chemical Engine... (5,1%)
- Computer Scienc... (5,8%)
- Agricultural an.. (7,2%)
- Social Sciences (9,4%)
- Enviromental S.. (24,6%)
- Engineering (13,0%)
- Physics and Ast.. (9,4%)

Source: https://www.scopus.com

Institutions worldwide by
co-authored publications (2018-2021)

🏛 **38 collaboration institutions**   📄 **82 co-authored publications**

Metric		Scholarly Output	Citations
🟦 International collaboation	33.6%	48	60
🟦 Only national collaboation	28.0%	40	57
🟦 Only national institutional collaboration	21.0%	30	28
⬜ Single authorship (no collaboration	17.5%	25	13

Source: https://www.scival.com

RESEARCH PROJECTS
Analysis of laser marking process parameters of new industrial materials for high-tech applications, No. 1.1.1.2/VIAA/3/19/474

- Important technical and laser parameters that influence the quality and durability of laser markings of different industrial materials are determined.

- A scientific research group is involved in active work with students of the bachelor study programme "Mechatronics" and the master study programme "Laser technologies".
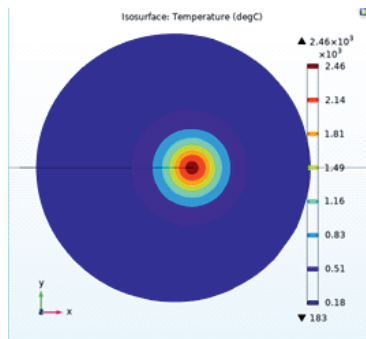
Temperature field on the surface of aluminium for laser power P = 1.5 kW and speed v = 25 mm/s

Contacts: ivaylo.balchev@rta.lv

Customized continuously variable transmission (CVT) for micro mobility vehicles Technology transfer support Agreement no. KC-PI-2020/62

Project aim: to commercialize an innovative stepless transmission device in the niche of the electric micro-mobility market - electric go-karts. Main activities: industrial research, experimental development, participation in international exhibitions and conferences to find and address potential customers; strengthening industrial property rights, preparing a commercialization offer and attracting experts. As a result of successful commercialization, the project team will scale the technology to such vehicles as electric micro-machines.

Results (December 31, 2022): The stepless transmission technology has been completed and tested, which has proved itself to be capable working in its final form and under the intended conditions. The testing took place on the Madona go-kart track. Overall, the pilot and his team received very important feedback as well as a positive quality rating.


Contacts: antons.pacejs@rta.lv

Application of deep learning and datamining for the study of plant-pathogen interaction: the case of apple and pear scab (lzp-2019/1-0094)

Project partners:

Institute of Horticulture; RTA, Institute of Engineering.

Project objectives:

- application of semantic analysis and data mining for plant-pathogen interaction data in apple/V.inaequalis and pear/V.pyrina pathosystems;
- development and implementation of an image-based deep learning system for early identification and evaluation of apple and pear scab;
- development of IoT-system model for apple and pear monitoring.
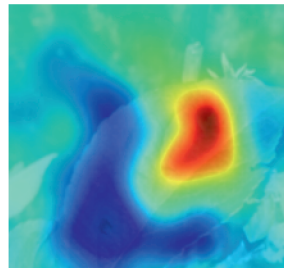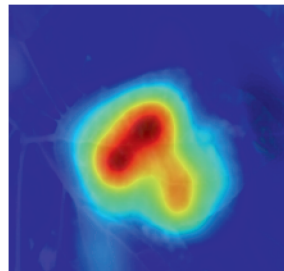
Contacts: sergejs.kodors@rta.lv

Development of autonomous unmanned aerial vehicles based decision-making system for smart fruit growing", project No. lzp-2021/1-0134"

Project partners RTA Institute of Engineering, Latvia University of Life Sciences and Technologies, Institute of Horticulture;

Project aim: to develop an autonomous unmanned aerial vehicle (UAV) based decision-making system for smart fruit growing that will automatically forecast fruit yields and identify apple scabs trough autonomous orchard flower surveys using UAV capable to identify, estimate and quantify apple scabs.
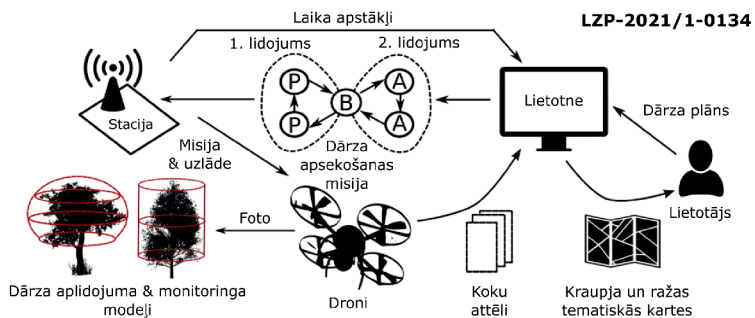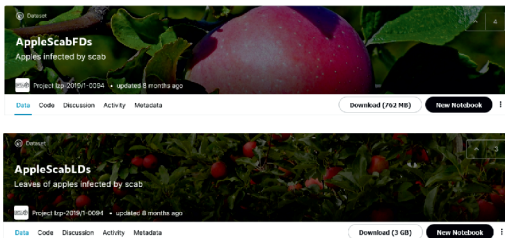
**Contacts:** imants.zarembo@rta.lv; sergejs.kodors@rta.lv

Integration of reliable technologies for protection against Covid-19 in healthcare and high risk areas No.6-1/5

Project partners: Riga Technical University, University of Latvia; Rezekne Academy of Technologies; Institute of Electronics and Computer Science; Latvian Institute of Organic Synthesis; Latvian Biomedical Research and Study Centre; Riga Stradiņš University; Latvian State Institute of Wood Chemistry WP4 Automated and robotic equipment for air and surfaces disinfection

Results of RTA team:
- Development of liquid disinfectant sprayer for mobile robot.
- Testing the mobile robot under real conditions.
- Development of disinfection gate and evaluation under real conditions.
- Development of equipment for surfaces and air disinfection with ozone and UV radiation and testing efficiency under laboratory conditions.

Project website: https://vppcovid.rtu.lv/par-projektu/
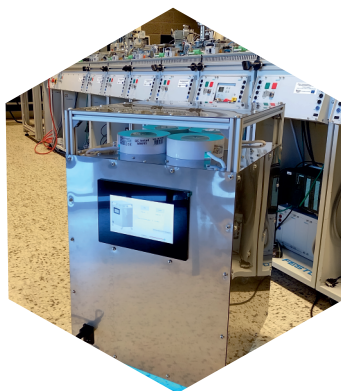
Contacts: andris.martinovs@rta.lv; ritvars.revalds@rta.lv

Life with COVID-19: Evaluation of overcoming the coronavirus crisis in Latvia and recommendations for societal resilience in the future (VPP-COVID-2020/1-0013)

Project partners: Riga Stradins University; the University of Latvia; Vidzeme University of Applied Sciences; the Institute of Electronics and Computer Science; Rezekne Academy of Technologies

The project aim: to evaluate the preparedness of the Latvian society to overcome crises and its capability to address it, and to prepare recommendations for future scenarios to help to reinforce the society's resilience.

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Latvian Language
(No. VPP-IZM-2018/2-0002)

Project partners: University of Latvia; University of Liepāja; University of Daugavpils; Ventspils University of Applied Sciences; Riga Technical University; Rezekne Academy of Technologies; Institute of Mathematics and Computer Science, University of Latvia; Latvian Language Agency.

The activity "To Study the Learning of the Language"

The main tasks: to obtain and analyse data on the situation of Latvian as a mother tongue, second language, and foreign language (skills and influencing factors); complement the corpus of language learners; to study positive experiences in preserving the Latvian language as the language of ethnic heritage; to develop recommendations in linguistic education, methodological recommendations and teaching aids for further action to improve the learning of the Latvian language by strengthening the sustainability and quality of the Latvian language.

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Digital Resources for Humanities:
Integration and Development (DRH-ID)
VPP-IZM-DH-2020/1-0001

Project partners: University of Latvia, Rezekne Academy of Technologies, Liepaja University, Latvian Academy of Culture, Riga Technical University, National Library of Latvia.

The general aims of the project are to provide support for the use and further development of existing digital resources and tools for humanities in order to advance research, education, and public understanding of digital humanities in Latvia. The RTA team will focus on resources of the regional Latgalian language: the corpus of written Latgalian (MuLa,) to expand this corpus by texts published after 2012 with an emphasis on texts following the standard implemented in 2007. , a corpus of spoken Latgalian that will show the speech of different age groups, as well as regional and functional varieties.

Project website: https://ltg.korpuss.rta.lv/en/home/

Contacts: sanita.martena@rta.lv

E-mentor as a Transformation tool for Ensuring Zero-Waste Food Consumption in Educational Institutions No. lzp-2020/2-0115

Project aim: to examine the possibilities of maintaining an equilibrium between food supply and demand in educational institutions by using an electronic mentor (hereinafter E-mentor) tool, which promotes zero-waste food consumption and contributes to the consumption of local food products.

Main project results:

recommendations for Rezekne city educational institutions, their closed-style canteens, policy makers and other institutions whose decisions and actions can influence the reduction of food waste generated by educational institutions;

a prototype of the E-mentor tool has been designed to ensure more efficient management of catering at educational institutions. For designing the prototype of the E-mentor tool, the researchers based the forecasting method on modelling and simulation, or the Monte Carlo method, and also made changes to food storage planning, replacing a optimal strategy for food storage with a strategy for optimizing the quality of catering.

E-mentor
RTA
Smart food consumption

Contacts: anda.zvaigzne@rta.lv

The research project's **field study** identified plate waste **in 7 schools of Rezekne city,** which remained after lunch for schoolchildren in grades 1-7, examining **a total of 7064 lunch samples.** An analysis of plate waste by food category showed that beverages accounted for the largest share of total plate waste (42.24 %), followed by staple food (28.38 %) and meat (11.77 %).

Field study photos taken in the Rezekne city school canteens

Towards sustainable development and inclusive society in Latvia: response to demographic and migration challenges (DemoMig). Project No. LV VPP-IZM-2018/1-0015

Project partners: University of Latvia, Latvia University of Life Sciences and Technologies, Rezekne Academy of Technologies

The aim of the project is to assess and respond to migration and demographic challenges in order to foster sustainable development and inclusive society in Latvia.

Project results:

- Academically, the project will contribute to the existing field of demography, migration and regional studies by creating new findings from both theoretical and empirical perspectives;

- the dissemination of research results to the scientific world and to the institutions of public administrations that operates for policy development;

- the discussions and open debate with civil society and the general public;

- in order to achieve a greater impact on the national audience, a scientific monograph in Latvian language has also been planned to be issued.

Implementation of Transformative Digital Learning in Doctoral Program of Pedagogical Science in Latvia (DocTDLL) Project No. lzp-2018/2-0180

Project partners: Rezekne Academy of Technologies; Toronto, Ontario University, EILAB, Canada

Project aim: to create a new pedagogical knowledge and technological know-how in the field of transformative digital learning (TDL) in higher education in Latvia based on Canadian experience and to ensure transfer of knowledge and skills in the further development of the doctoral study program "Pedagogy", as well as the development of scientific, academic and practical capacity of researchers and educators.

Results:

- Adapted tools of questionnaires for Latvian conditions and culture environment and questionnaires for Latvian higher education institutions using custom tools: "Personal and Cultural Orientation Scale" and "Digital Competence Profiler". Data processing and a statistical report preparation to create new knowledge in the field of digital education.

- Development of two 10-credit or 15 ECTS modules / courses for the doctoral study program "Pedagogy" - didactic theories and research in digital learning, including practice, research and practice synergy for the consolidated doctoral study program RTA module "Special education and social work".

Project website: https://tdl.rta.lv/mod/page/view.php?id=10

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RTA RESEARCH GRANTS
Use of 3D printing technologies for the production of orthopedic prototypes

Project aim: to develop scientifically based techniques for the development and functional use of prototypes made with 3D printing technologies.

DEVELOPED PRODUCTS: fixator for wrist;
fixator for knee;
fixator for foot.
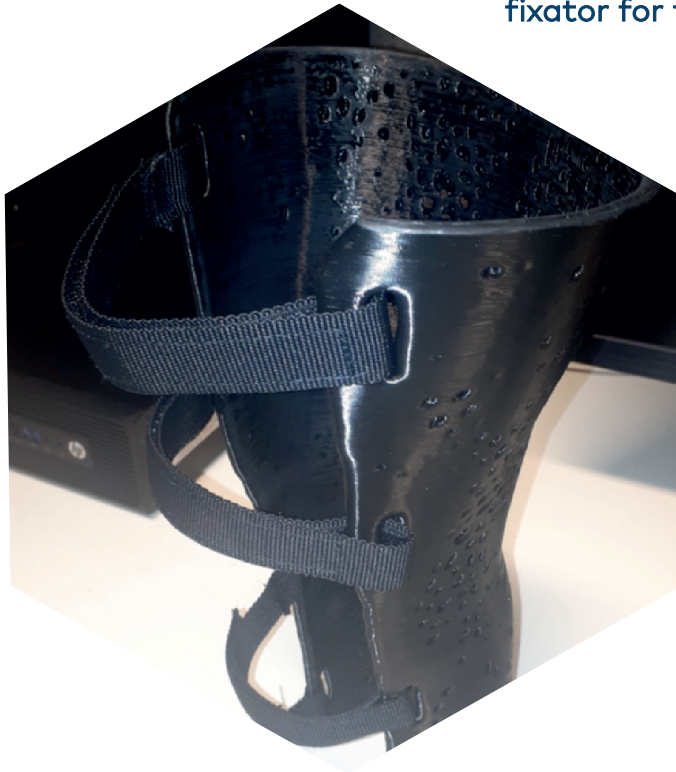
Contacts: silvija.mezinska@rta.lv

Design solutions for functional products for children with autism spectrum disorders

Project aim: to develop suitable products for children with autism spectrum disorders (ASD) using advanced technologies in research.

The product developed by RTA students: vest design for children with ASD.
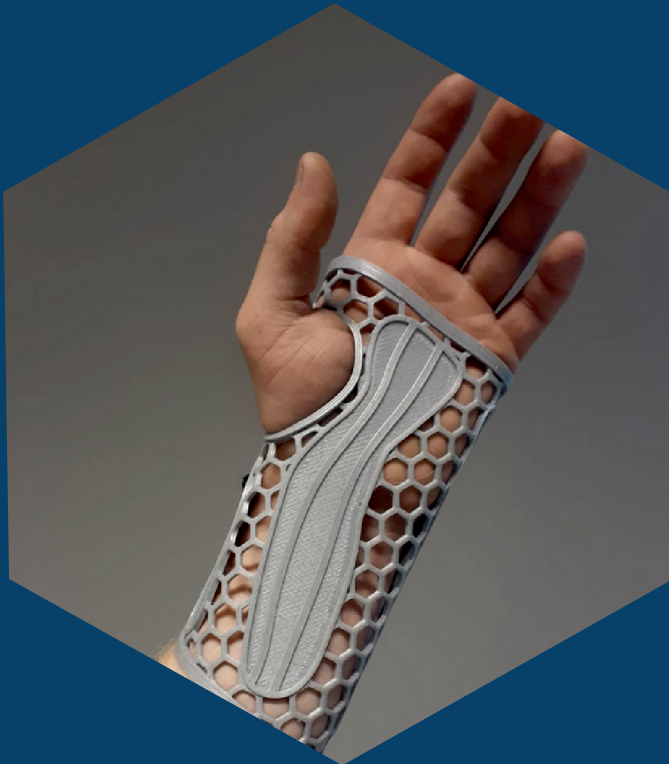
**Contacts:** silvija.mezinska@rta.lv

CREATIVE PROJECTS

Art Album ,,Watercolorist Vladislavs Paurs''

The art album "Watercolorist Vladislavs Paurs" is a historical collection of works of art by Vladislavs Paurs (1945 - 2019), an associate professor of RTA and outstanding representative of Latgale watercolour paintings, which were collected after his death. The artist has left a significant legacy of works of art, which are fragmentarily published in artist's exhibition catalogues. The album, which is prepared both: in paper and digitally reveals the subtle nuance of the artist's paintings.

Accesible here: http://books.rta.lv
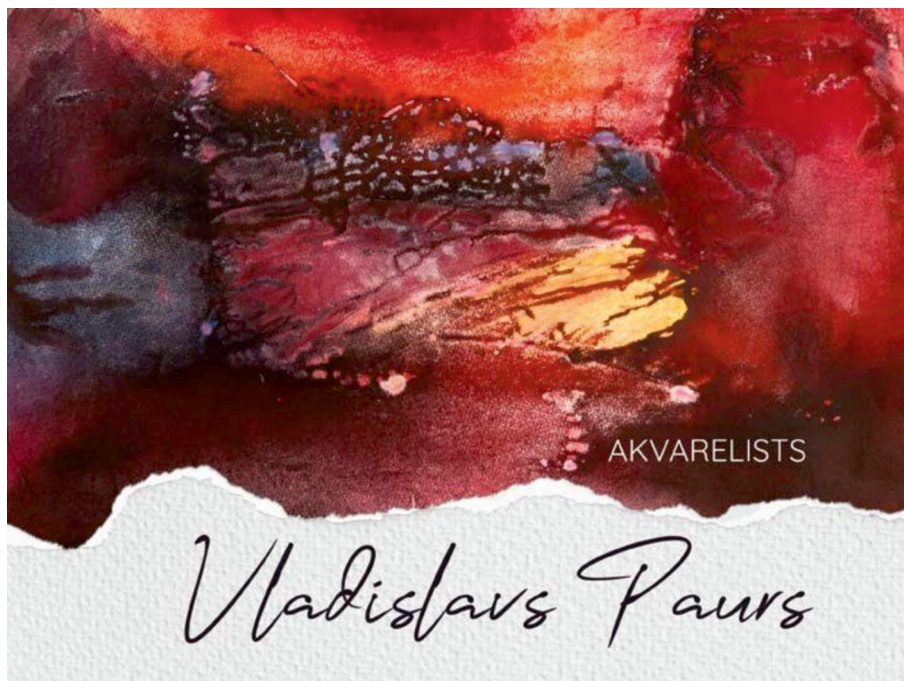
Contacts: diana.apele@rta.lv

Reading book in Latgalian
"Burtu vuoceleite" (LKP2021/69)

Fascinating book in terms of content and illustrations in Latgalian language "Burtu vuoceleite", published in paper and electronic format. Author of the book – poet, RTA graduate Ineta Atpile-Jugane; book layout designer – RTA graduate Ieva Šiliņa.

This book will contribute to promotion of the Latgalian language in Latvia and in the world, will supplement the collections of children and school libraries and will be gifted to visitors of presentations.
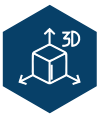
Accesible here: http://books.rta.lv
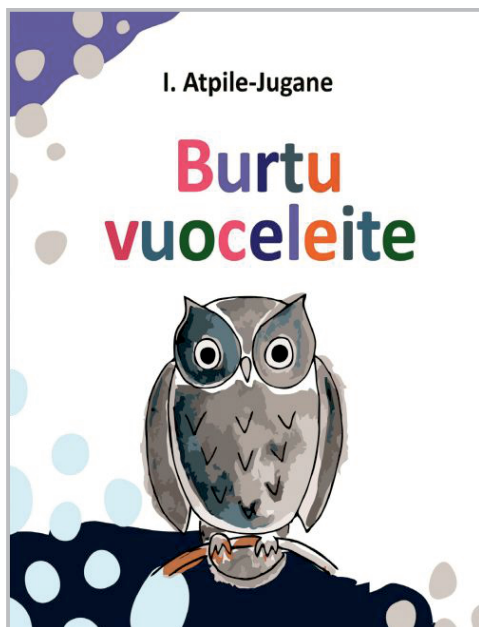
Contacts: aina.strode@rta.lv

POTENTIAL FOR NEW PRODUCTS AND SERVICES

RESEARCH AND INNOVAATION
Three research institutes
and modern laboratories in the field
of engineering technologies,
regional economics, personality
socialization and education science

3D MODELLING
Study programmes in environmental and interior design
CAD training course and CAD construction
File preparation for CNC machining

PROTOTYPE
Rapid prototyping machines
Industrial CNC machines
Physical Processes and Laser Technologies
Research Centre
Hospitality Laboratories
Pilot projects

Contacts: Science and Project Management Department,
zppd@rta.lv

IF NOT US, WHO?

TESTING
Chemistry, microbiology, electronics, electrical engineering, physics, construction, and other laboratories

PRODUCTION
Mechatronics and robotics classes
Physical Processes and Laser Technologies Research Centre

COMMERCIALISATION

Patents
Business plans
Business Incubator
SalesLabs

QUALITY OF LIFE
Recommendations for the state and regional national economy, culture, and language policy
New services in education and culture
Creative and innovative environment

WHY REZEKNE?
WHY RTA?

OBJECTIVES OF RTA:

- outstanding research,
- synergy of research and teaching,
- promotion of the research results,
- focus on open innovation.

The vision of RTA is to become an internationally competitive academy of technologies in the European higher education and research area in integrated engineering, social and humanitarian sciences with motivated and creative students who are demanded on the labour market and with open and dynamic academic and research environment for sustainable development of societies.

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http://www.instagram.com/RezeknesTehnologijuakademija
http://www.twitter.com/RezTehAkademija

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Photo by Māris Justs, publicity photo