Name of the Faculty/Institute
Faculty of Agricultural Sciences and Biosystems Engineering

Completed projects 2018 - 2023

№	The name of the completed project, indicating the field of science and scientific direction	Year	Head of the project	Project Performers
1	Citrusy, berry and medicinal, environmentally friendly Aromatic wines, alcohol, liqueurs and other functional purposes from pure and harmless plants Development of new innovative technologies for the production of alcoholic and non-alcoholic beverages". Scientific direction: food technology	2019-current	G. Tkemaladze	M. Dolidze G. Kvartskhava V. Dolidze K. Makhashvili
2	Technology of care and cultivation of garden peas. Field of science: agriculture. Scientific direction: horticulture	2019-2021	Nato Kakabadze	farmers and Caucasus Regional Environmental Center.
3	Technology of care and cultivation of buckwheat.	2019-2021	Nato Kakabadze	farmers and

	Field of science: horticulture. Scientific direction: grain industry.			Caucasus Regional Environmental Center.
4	Technology of maintenance and cultivation of annual crops	2021	Nato Kakabadze	The company "Barakha"
5	The main woody species forming the forest of the surroundings of Tbilisi and the peculiarities of their distribution in the light of global climate changes	2018-2022	Prof. G. Gagoshidze	Associate Prof. Z. Tiginashvili - forestry expert; Doctoral student G. Jincharadze - specialist
6	Cultivation of red grape vine varieties in the non-traditional wine growing area, research of organoleptic parameters of wine made by traditional method; Viticulture and winemaking	2018-2024	G. Andriadze - Director of the Scientific and Research Center for Viticulture and Winemaking of the Patriarchate of Georgia	Nino Chkhartishvili, T. Jajanidze
7	Study of total polyphenols and flavonoids of wine made by different methods to evaluate antioxidant activity, agricultural science, winemaking	2019-2020	Prof. Sh. Shatirishvili	Prof. N. Chkhartishvili; Master N. Jobashvili
8	The influence of maceration methods on the phenolic	2018-2020	Enologist M. Meskhidze	Prof. M. Khomasuridze

	compounds of Kakhuri green and Krakhuna grape wine			Master M. Maisuradze
9	Development of new innovative recommendations for the production of new Georgian functional purpose products using wild and cultivated, ecologically clean, safe plants in Georgia.	2018-2022	Tkemaladze Guram - Professor Kvartskhava Giorgi - professor	Dolidze Malkhazi, Gagelidze Nino, Makhashvili Ketevani, Bokeria Akaki, Mamardashvili Naira, Dzneladze Sofo
10	"Study of common blueberry pests and diseases in the plains and highlands of Adjara and the development of measures to combat them"	2023-2027	Academician - Guram Aleksidze	Guram Chkhubadze
11	Phytogenetic resources of Georgia. Appropriate geographic-physical and climatic-soil indicators determine the variety of vegetation and allow the cultivation of useful, including berry plants.	2021 - current	Vasil Ghlighashvili Tamar Kacharava	Tinatin Epitashvili, Mariam Khocholava
12	"Study of sowing norms of oat mixed chertsvela for use as green food in the conditions of Shida Kartli (Doesi village, Kaspi district)"	2021-2022	Baidauri Lali	Baidauri Dali

1. One of the directions of the research studies of the Department of Food Technologies of GTU is the development of new technologies and providing recommendations for the production of alcoholic and non-alcoholic beverages, as well as the improvement and of their assortment using ecologically clean and safe plants by utilizing wild-grown and cultivated species in Georgia, and improving the range of assortments. The production of ecologically clean, safe, balanced food with plant ingredients - a necessary prerequisite for the dramatic refinement of human life, health and well-being and protection against various diseases.

2. Grybov, Crimea, Union Institute of Horticulture, World Center of Horticulture (Taiwan) and others have been studied. Many varieties of garden and green peas were obtained, which adapted to the soil-climatic conditions of Georgia and showed promising results. Modern approaches in the technology of care and cultivation of garden peas are described.

3. Features of buckwheat care and cultivation, protection of buckwheat plants from pests and diseases, as well as agrotechnical measures to fight against weeds are described. In order to increase the production rate and economic efficiency of buckwheat, various technologies were studied.

4. For the profitability of agriculture, it is necessary to arrange field crops and vegetable crops according to the requirements of agroclimatic factors, mainly according to their dependence on the heat regime.
Knowing the characteristics of agro-climatic zones allows vegetable crops to be grown in favorable conditions. Sowing-planting and harvesting terms of vegetable crops according to horticulture zones were studied.

5. Global warming has brought significant corrections to the current state of growth and development, natural renewal and other characteristics of forest vegetation in the vicinity of Tbilisi, which were unexplored in the last 30 years, therefore the need to carry out relevant studies and measures to optimize forest ecosystems in the city's surroundings has become a priority. The need for the aforementioned stems from the fact that they should be promoted to improve them, to ensure the maintenance of the living environment necessary for the existence of the population of the city and nearby settlements. By observing a number of characteristics of natural renewal (seed, vegetative), species change, phytosanitary condition and growth in the oak (Q. iberica), cypress (C. caucasica) and other woody groves of the outer perimeter of Tbilisi, the existence of forests in general in the near and distant future, their It is possible to predict the probable state and the possible potential of performing the main functions.

In 2020, we conducted research in the areas of Tskneti and Akhaldabi, in order to study the natural renewal of Georgian oak and other woody species (Caucasian hornbeam, field maple, common ifan, field elm, Ukhrav, Caucasian lime and other insignificantly represented species). Based

on the analysis of the average data of seven sample areas, it was found that the vegetation renewal of the main species - oak, mainly due to unregulated cattle grazing and unsystematic extraction of shoots by the population, is practically non-existent, and the same can be said for other woody species. As for the regeneration of oak and other species with natural seeds, on the basis of the currently available method of estimating the mentioned parameter according to the number of reliable young adults, it is unsatisfactory based on the average data of the material obtained as a result of the research on the sample areas, the reason for which, in addition to the anthropogenic factor, is the climatic, in particular, the increase in air temperature and based on it There is also a negative influence of biological weakening of forest vegetation, hence other biotic factors, especially activation of harmful organisms, reduction of relative air humidity and other more or less important factors affecting the forest.

According to the results of the research, the fact of the ongoing process, which is progressing noticeably in recent years, was also revealed. It is about the tendency of erosive and landslide processes to become more active in the area of Udzo mountain, which requires detailed research and appropriate preventive measures in the near future. The deplorable result is already visible, and it implies not only the irreversible process of destruction and collapse of large land masses, but also the cutting off of certain sections of the forest developed on them and sinking into the depth of the ravine, which creates the danger of damming of the waste water nearby with the accompanying consequences.

6. The Technical University of Georgia continues to cooperate with the Scientific Research Center of Viticulture and Winemaking of the Patriarchate of Georgia and Wine Laboratory LLC within the framework of the Memorandum of Cooperation. The project, which was initiated by the Scientific Research Center of Viticulture and Winery of the Patriarchate, aims to cultivate red grape vine varieties in the non-traditional wine-growing area of Georgia and beyond, to make wine using the traditional method and to study its organoleptic parameters.
The project started in 2017 and was planned for 4 years, however, due to a number of issues, it was extended for a full three years. So the implementation of the long-term project is planned for 2017-2024.
2 plots of land were selected, both in Lazeti (in present-day Turkey). Soil analysis was carried out and Georgian grape varieties were planted (2017-2018). Agro-technological events were held in the newly planted vineyard. In 2020, the vineyard was created 2 years ago. As you know, a newly planted vineyard gives signs of the first harvest from the third year.

7. Recently, winemakers have given special importance to those substances that determine the color, bouquet, aroma, extractability and others of wine. These substances are formed in the grapes during the ripening period, and they are transferred to the wine material during the alcoholic fermentation process and during the aging period. With the content of these substances, red wines are especially distinguished, among them, a special place is occupied by Georgian Safera. Wines obtained from white grape varieties of Georgian vines obtained by full fermentation on Durdo

according to the traditional Georgian method are distinguished by no less healing properties. In this regard, Rkatsiteli breed is worth mentioning. It is well known that phenolic compounds and their transformation products take an active part in forming the type of wine during its production - at all stages of storage and have a direct impact on taste, bouquet, color, transparency and stability. A relatively high amount of phenolic compounds is necessary and has a positive effect on the formation of taste properties. The results of the research project revealed that the participation of the solid parts of grapes in alcoholic fermentation changes both the organoleptic indicators, as well as the content of polyphenols and flavonoids, which positively affects both the quality of the wine and the organoleptic indicators, the antioxidant and healing properties of the wine, which was confirmed by the analyzes conducted during the research.

8. The influence of maceration methods on the content of phenolic compounds of Kakhuri green and Krakhuna grape wine
Based on the title, the aim of the project was the effect of maceration methods on the content of phenolic compounds of Kakhuri green and Krakhuna grape varieties. Within the framework of the project, the phenolic compounds in the wine obtained by different fractions of two white grape vine varieties: Kakhuri green and Krakhuna were studied, because in today's scientific literature, wine is increasingly considered as a functional food and biologically active substances, phenolic compounds play an important role in the assessment of its quality. organic acids, amino acids and others.
In order to achieve the results of the project, the quantitative determination of total phenols and wine antioxidants (resveratrol, quercetin, myricetin) was carried out.
As a result of the conducted research, the quantitative content of total phenols was found, where the highest rate was found in the wine made from the Krakhuna grape variety, followed by Manavi green.
In terms of antioxidant compounds (resveratrol, quercetin, myricetin) in wine, the content of cis and trans resveratrol myricetin and quercetin was found in the wine made from Krakhuna grape variety.
Wines obtained from fractions I and II of two Manavi greens were taken for comparison, where a slight difference between their antioxidant compound contents was revealed.
From the grape varieties used in the experiment, among the antioxidants, quercetin was identified with the highest quantitative index, followed by myricetin. It was also found that as a result of the experiment conducted in the research grape varieties, the content of trans-resveratrol is higher than that of cis-resveratrol.
Among the antioxidants among the grape varieties used, Manavi green stands out with the lowest quantitative cis-resveratrol index.

9. Young plants in natural conditions allow to create flavored drinks with functional purposes. In the research, raw materials of young plants in the Imereti region were used: black grass (Leonurus cardiaca), barambo (Melissa officinalis), hawthorn (Crataegus caucasica), kulmukho (Inula

helenium), kothuji (Acorus calamus), forest shindig (Cornus mas), Forest blackberry (Rubus fruticosus), plum (Prunus domestika), currant (Ribes alpinum), kiwi (Actinidia chinensis), fig (Ficus carica) and horsetail (Hippohae rhamnoides). Blending with Rkatsiteli wine with herbal spirits was carried out. The results of the research (taste properties, aroma and visuals) confirm that the selected material, the developed recipe, improved chemical-physical and organoleptic parameters enable the production of aromatic drinks with a positive effect.

Today, much attention is paid to the production of high-quality natural food products, which leads to the growth of the product range. In this direction, special attention is paid to alcoholic beverages, the demand for which is growing intensively. Drinks with the best properties and organoleptic characteristics are created by using technologies. They study their positive and negative qualities. In folk medicine, there are quite a large number of plants that are used for treatment. The use of the plant for this purpose is mainly determined by the active biologically active substances (ban) present in it. Sakar Tvelo is rich with a wide range of both fruits and medicinal plants. All this gives an opportunity to create liqueurs of diverse character, which will be saturated with medicinal plants rich in aroma and chemical properties. The aim of the research is the production of dessert liqueurs and the improvement of their antioxidant properties by adding extracts of medicinal plants containing ban - barambo, black grass and hawthorn.

10. Pests and diseases common to blueberries in the plains and highlands of Adjara will be described; The species composition of the causative organisms will be determined; Dominant harmful species will be identified and the features of their development and distribution will be studied. Modern ecologically safe biological and relatively less dangerous chemical means will be tested to fight against dominant harmful species. Recommendations for pest control will be developed.

11. The phytogenetic resources of Georgia are called open sky banks. Appropriate geographic-physical and climatic-soil indicators determine the variety of vegetation and allow the cultivation of useful, including berry plants.

The research is dedicated to one of the important priorities of human development - biodiversity protection-sustainable use and directly expresses the slogan of the United Nations - "biodiversity protection is the basis of sustainable development", namely the commercialization of an important berry culture, currant. The work is very relevant since it concerns the stable provision of harmless products of this berry culture for the population, which is one of the important tasks for the food security of the country and which depends not only its production but also the health of the population of our country.

During the investigation of the genetic resources of useful plants of Georgia, it was found that this unique and diverse wealth of the country is insufficiently cataloged and used. Moreover, technologies for rational use even for those plants that are the subject of wide consumption have not been developed. Their number includes such a popular plant as the genus of currants (Ribes).

The currant genus (Ribes) is one of the important berry plants of the flora of Georgia, from the Grossulariaceae DC family, there are many cultural forms and varieties of it. Their use is versatile, however, the research of wild species, the ancestor of cultural forms, is always interesting and

relevant. Moreover, biodiversity protection - preservation and sustainable use is one of the main priorities of modern times. The issue is especially important for Georgia, a country with a small land area and rich in unique biodiversity. Moreover, especially in the modern period, when one of the important and economically profitable directions of Georgia is the development of the tourism industry. We consider it important to connect scientific research and the economic-tourist potential of the country. In this regard, every corner of Georgia is a field of interest, and one of the outstanding ones is Adjara.

As a result of the analysis of ethnobotanical traditions and literary sources,

The aim of the study: the wild distribution of the wild currant in the highlands of Adjara, adapted to the parameters of the local ecosystem, Ribes. Unstudied species: Ribes bibersteinii Berl. ex DC.(rock currant) and Ribes alpinum. (mountain currant), selection of technological modes to obtain high-quality raw materials and products.

Scientific novelty of the research - the qualitative and quantitative content of useful, biologically active substances in the leaves, fruits and products of the local species of mountain and rock currant was scientifically substantiated. The qualitative and quantitative amount of carbohydrates, organic acids in both fruits and manufactured products was determined.

The practical value of the research - one of the important and economically profitable directions of Georgia is the development of the tourism industry, especially in the Adjara region. It will be interesting to determine the technology of production of products full of strong vitamins. As a result of the analysis of ethnobotanical traditions and literary sources, we selected currant, one of the widely used plants in the highlands of Adjara. The species, cultural forms, and varieties of the current genus (Ribes) have extremely high medicinal/medicinal and food value, and they are widely used for cosmetic and perfumery purposes as well.

A database of medicinal phytogenetic resources of Tianeti was created.

12. The rich and unique biological resource of Georgia is a natural-historical and strategic wealth, which requires constant protection-conservation and restoration. The problem is especially relevant for our small-land country, which is the center of origin of many cultivated flora, fauna and their wild ancestors. Unique species that are not found anywhere else are spread here. Unfortunately, many of them are currently on the verge of extinction, the erosion processes of genetic resources are deepening, there is an uncontrolled export. Therefore, it is necessary to ensure biodiversity conservation ex-situ and in-situ/on farm.

In modern conditions, when the economy of Georgia is involved in integration processes, rational and effective use of natural resource potential is of urgent importance.

Among the country's natural resources, one of the important places is occupied by bioresources, which are distinguished by their diversity, and the scale of development of the national economy, the deepening of integration processes, and the solution of acute social problems depend significantly on their effective use.

Georgia, as part of the Caucasus, is recognized as one of the special regions in terms of biodiversity - a "hot spot" of biodiversity, whose nature is distinguished by a high level of species diversity, endemism and ecosystems of global importance.
The sustainable development and effective use of unique endemic species of bioresources takes a leading role in modern nature management approaches.
An area of 50 m2 (meadow brown soil) was allocated for the test, which was studied according to the plan, structural indicators according to the sowing dates, for which we had taken six options with different sowing rates. Agro-technical works were carried out in the trial: mineral fertilizers were applied to the test plot before sowing: phosphorus, potassium and nitrogen during pre-sowing treatment. Weeding, sowing, structural analysis and green mass collection were carried out.

According to the two-year average data of the green mass yield of the oat mixture Certsvela (in c/ha), the 5th option stands out with good indicators of green mass yield, where 130 kg was planted with 70 kg of tsertsvela. Oats, therefore the two-year average green mass harvest data in this option is 274 pcs. Therefore, it makes no sense to increase the norm of sowing oats.

With the correct selection of food crops, sowing and timely and sequential implementation of agro-technologies, it is possible to obtain high green mass, stable and complete food, for which it is necessary to use practical methods effectively.

არქიტექტურის,
ურბანისტიკისა და დიზაინის ფაკულტეტი

2018 – 2023 წლის სამეცნიერო/ არქიტექტურული პროექტები

№	შესრულებული პროექტის დასახელება, მეცნიერების დარგისა და სამეცნიერო მიმართულების მითითებით	წელი	პროექტის ხელმძღვანელი	პროექტის შემსრულებლები
1	**.„ახალი ბანას“ სამოწასტრო-საგანმანათლებლო და კულტურულ-საზოგადოებრივი ცენტრი.**	2018 წლის 17 იანვარს	ბ.ტატიშვილი ნ.იმნაძე B. Tatishvili	ბ. ტატიშვილი ნ.იმნაძე ვ.ნოსელიძე

	"Akhali Bana" monastic-educational and cultural-social center.		N. Imnadze	B. Tatishvili N. Imnadze V. Noselidze
2	**გერმანულ–ქართული საერთაშორისო სამეცნიერო-პრაქტიკული პროექტი: ახალი საზოგადოებრივი სივრცის (Urban Hub) კონცეფციის შემუშავება ქ. რუსთავის მაგალითზე.** **German-Georgian international scientific-practical project: development of a new public space (Urban Hub) concept in St. on the example of Rustavi.**	2018-2019	ნ.იმნაძე; თანახელმძღვანელები გერმანელი არქიტექტორები GEOBAY - ბავარიის არქიტექტორთა საერთაშორისო კავშირის პრეზიდენტი არქიტექტორი კარლჰეინზ ბეერ; არქიტექტორი, დოქტორი იორგ ჰეილერი, არქიტექტორი იაკობ ობერპილერი, შ.პ.ს. „ბაზალტ ფაიბერის“ დირექტორი გიორგი გოგოლაძე N. Imnadze; Co-leaders German architects GEOBAY - President of the International Union of Bavarian Architects, architect Karlheinz Behr; Architect, Dr. Jörg Heiler, Architect Jacob	ბაკალავრიატის სტუდენტები Undergraduate students

			Oberpiller, Sh.P.S. Director of "Basalt Fiber" Giorgi Gogoladze	
3	**ქ. ბათუმის ცენტრის წინასაპროექტო კვლევა და ურბანული რეკონსტრუქციის პროექტი.** **St. Batumi center pre-design research and urban reconstruction project.**	2018	ი.მურღულია I.Murgulia	ფაკულტეტის ბაკალავრიატის სტუდნტები (65211 ჯგ.) Undergraduate students of the faculty (65211 students)
4	თბილისი-რუსთავის ურბანულ-რურარული კავშირების შესახებ. (ხელმძღვანელი ასოც.პროფ. დ. ბოსტანაშვილი) **About Tbilisi-Rustavi urban-rural connections.**	2018	დ.ბოსტანაშვილი(**Head Associate Prof. D. Bostanashvili)**	გვანცა ცქიფურიშვილი G.Tsqifurishvili
5	**საერთაშორისო პროექტი „ Sustainable City-Waste Management System, Municipal Card, Mobile Application";**	2019	ნ.იმნაძე მ.ფოჩხუა ნ.ჩაჩავა N. Imnadze M. Pochchua N. Chachava	**გ.გაბუნია** **ო.მჭედლიშვილი** **გ.ქორთუა** **G. Gabunia** **O. Mchedlishvili** **G. Courtois**
6	კომპანია „ეუროფასადის" შოურუმი **Showroom of "Eurofasad" company**	2019-2020	ნ.იმნაძე ვ.ქობულია N. Imnadze	**ბაკალავრიატის სტუდენტები**

			V. Kobulia	**3-year undergraduate students**
7	პროექტი: „ზემო ნიქოზის ხელოვნების სკოლა“ Project: "Upper Nikos Art School"	2019	ნ.იმნაძე ბ.ტატიშვილი B. Tatishvili N. Imnadze	**ბაკალავრიატის სტუდენტები (3 კურსი)** **3-year undergraduate students**
8	ტყვიავის კულტურის სახლის რეკონსტრუქციის პროექტის, სოფელ ზემო ნიქოზის კერამიკის სკოლის პროექტის და ძვ. თბილისში ო. თუმანიანის ქუჩაზე არსებული ისტორიული შენობის რეაბილიტაციის პროექტი Tkviavi House of Culture reconstruction project, Zemo Nikoz village ceramics school project and B.C. In Tbilisi O. Rehabilitation project of the historical building on Tumaniani Street	2020	ბ.ტატიშვილი B. Tatishvili	**ბაკალავრიატის სტუდენტები (3 კურსი)** **3-year undergraduate students**
9	სსაერთაშორისო პროექტი„წეროვანის დასახლების ხელახალი კულტურული დაგეგმარება International project "Cultural re-planning of Tserovani settlement	2020	ნ.იმნაძე, დ.ბოსტანაშვილი, ნ.კვანჭიანი,ს.გუგუნავა N. Imnadze, D. Bostanashvili, N. Kvanchiani, S. Gugunava	**ბაკალავრიატის 3 კურსისი სტუდენტები** **3-year undergraduate students**

10	**ქართულ-გერმანული საკონკურსო პროექტი „რკინის გზის სადგურის პროექტი ქ. თბილისის მერიასთან ერთად“.** Georgian-German competition project "Railway station project in St. Together with Tbilisi City Hall".	2021-2022	ნ.იმნაძე, მ.ბოლქვაძე,მ.ფოჩხუა N. Imnadze, M. Bolkvadze, M. Pochkhua	**ბაკალავრიატის 3 კურსის სტუდენტები** **3-year undergraduate students**
11	**ხუდადოვის ტყე - პარკის განვიტარების პროექტი** **Khudadov forest - park development project**	2022	მ. ბოლქვაძე M. Bolkvadze,	**ბაკალავრიატის მე-4 კურსის სტუდენტები: - მარიამ გოგოჩიშვილი, სანდრო ნავროზაშვილი, ანი ბურდული, თამთა კუპრაძე** **4th year undergraduate students: - Mariam Gogochishvili, Sandro Navrozashvili, Ani Burduli, Tamta Kupradze**
12	პროექტი - „ფოთის ახალი სისცოცხლე - 2022 წ. 9 აპრილის ხეივნის რეაბილიტაცია **The project - "New excitement of Poti - 2022 Rehabilitation of April 9 Alley**	2022	ნ.იმნაძე,ბ.ტატიშვილი, ბ.თინიკაშვილი, ა.დიღმელაშვილი N. Imnadze, B. Tatishvili, B.	**ბაკალავრიატის 4 კურსის სტუდენტები** **4th year undergraduate students**

			Tinikashvili, A. Digmelashvili	
13	„ოზურგეთის ახალი სიცოცხლე-2022 "New life of Ozurgeti-2022".	2022-2023	ნ.იმნაძე, ბ.ტატიშვილი N. Imnadze, B. Tatishvili,	**მაგისტრატურის 1 კურსის სტუდენტები Master's 1st year students**
14	ერთბინიანი საცხოვრებელი სახლი რუის პირში	2022	მ. მალაღურაძე	**მ.მალაღურაძე ნ.ქიქოძე**
15	ვარკეთილი „ფეიქარი 95“ გრგ-ს კორექტირება	2022	მ. მალაღურაძე	**მ.მალაღურაძე ნ.ქიქოძე**
16	ერთბინიანი საცხოვრებელი სახლი დუშეთის რაიონის	2022	მ. მალაღურაძე	**მ.მალაღურაძე ნ.ქიქოძე**
17	ერთბინიანი საცხოვრებელი სახლი ქ.თბილისი. სოფ. კვესეთი ბეთანია თბილისის მერია შეთანხმების პერიოდი AR1936519	2022	მ. მალაღურაძე	**მ.მალაღურაძე ნ.ქიქოძე**
18	თბილის ჰილზი დიზაინ პროექტი საცხოვრებელი სახლი	2023	მ. მალაღურაძე	**მ.მალაღურაძე ნ.ქიქოძე**
19	კონკურსები:მონუმენტი სამშობლოსათვის თავდადებული გმირებისთვის ახალციხეში, ზვიად გამსახურდიას ძეგლი თბილისში	2021	მ. მალაღურაძე	ნინო ქიქოძესთან და მოქანდაკე ნიკოლოზ ტაბიძესთან ერთად
20	ქ.თბილისი, ჯავახიშვილის ქუჩა N84-ში ბინის ინტერიერის პროექტი, რეკონსტრუქცია, მიღებულია მშენებლობის ნებართვა	2021	ნ.ქოჩლაძე ბ. თინიკაშვილი	ნ.ქოჩლაძე ბ. თინიკაშვილი

21	ქ. თბილისი, დიდი დიღომი, მე-4 მიკრორაიონი, სავაჭრო ცენტრი, მიღებულია მშენებლობის ნებართვა	2022	ნ.ქოჩლაძე	ნ.ქოჩლაძე
22	ქ. თბილისი, ირბახის ქუჩა N15, დაშენების საპროექტო წინადადება	2022	ნ. ქოჩლაძე	ნ.ქოჩლაძე
23	ქ.თბილისი, სოფელ წავკისი მიმდებარე ტერიტორიაზე, კუთვნილი მიწის ნაკვეთებზე ინდივიდუალური საცხოვრებელი სახლების განაშენიანების რეგულირების გეგმის გეგმარებითი დავალების წინასაპროექტო კვლევა.	2022	ნ. ქოჩლაძე	ნ.ქოჩლაძე
24	ქ. თბილისი, სოფელი თხინვალა, ნაკვეთი (ს.კ. 72.16.33.093), ინდივიდუალური, ერთბინიანი საცხოვრებელი სახლი, მიღებულია მშენებლობის ნებართვა	2023	ნ.ქოჩლაძე	ნ.ქოჩლაძე
25	დუშეთის რაიონი, სოფელი მლეთა, ინდივდუალური საცხოვრებელი სახლი. მიმდინარეობს მშენებლობა	2023	ნ.ქოჩლაძე	ნ. ქოჩლაძე
26	დუშეთის რაიონი, სოფელი მლეთა, ინდივდუალური საცხოვრებელი სახლი. მიმდინარეობს მშენებლობა	2023	ნ.ქოჩლაძე	ნ.ქოცლაძე

	ტურისტული კომპლექსი კოტეხის ღვინის ქარხანაში. არქიტექტურული პროექტი და ინტერიერის დიზაინი • Tourist complex in Kotekhi winery. Architectural project and interior design /co-author Manana Zhgenti-Khvediliani/	2021 - /2023	ნ.ხვედელიანი	/თანაავტორი მანანა ჟღენტი-ხვედელიანი
	წყნეთში ინდივიდუალური საცხოვრებელი სახლის არქიტექტურული პროექტი და ინტერიერის დიზაინი/ • Architectural project and interior design of an individual residential house in Tskneti/	2021 - 2023	ნ. ხვედელიანი	თანაავტორი მანანა ჟღენტი-ხვედელიანი/ co-author Manana Zhgenti-Khvedeliani
	შპს „დუგლაძეების ღვინოების კომპანია“ ადმინისტრაციული შენობის არქიტექტურული პროექტი და ინტერიერის დიზაინი/	2022 - 23	ნ.ხვედელიანი N.Khvedeliani	თანაავტორი მანანა ჟღენტი-ხვედელიანი/

	• Architectural project and interior design of the administrative building of Dugladze Wines Company LLC/co-author			Manana Zhgenti-Khvedeliani/
	შპს „ელიტზურგოვანის“ ორი ინდივიდუალური ორბინიანი საცხოვრებელი სახლი სოფელ ზურგოვანაში. არქიტექტურული პროექტი და ინტერიერის დიზაინი • Two individual two-room residential houses of "Elitzurgovani" LLC in the village of Rizkovani. Architectural project and interior design	2023	ნ. ხვედელიანი N.Khvedeliani	
	მცხეთა სოფ.არაშენდა ინდივიდუალური საცხოვრებელი სახლის არქიტექტურული პროექტი და ინტერიერის დიზაინი • Architectural project and interior design of an unbuilt individual residential house in Mtskheta village	2023	ნ.ხვედელიანი	
	წავკისში ინდივიდუალური საცხოვრებელი სახლის	2023	ნ.ხვედელიანი	

	არქიტექტურული პროექტი და ინტერიერის დიზაინი • Architectural project and interior design of an individual residential house in Tsavkisi			
	ღვინის ქარხნის რეკონსტრუქცია-რეაბილიტაცია გურჯაანში • Reconstruction-rehabilitation of the winery in Gurjaani	2021 – 22.	ნ.ხვედელიანი	
	მრავალფუნქციური კომპლექსი აღმაშენებლის ხეივანზე ქ. თბილისი Multifunctional complex on Aghmashenebeli alley, St. Tbilisi	2022 წ.	მ. ბოლქვაძე M.Bolqvadze	
	განაშენიანების რეგულირების გეგმა თვალჭრელიძის ქუცაზე ქ. თბილისი The development regulation plan on the block of Klochrelidze st. Tbilisi	2023 წ.	მ. ბოლქვაძე M.Bolqvadze	
	განაშენიანების რეგულირების გეგმა ნინუას ქუჩის მიმდებარედ ქ. თბილისი Development regulation plan in the vicinity of Ninua Street, St. Tbilisi	2023 წ.	მ. ბოლქვაძე M.Bolqvadze	
	განაშენიანების რეგულირების გეგმა ქ. მარნეულში (არქიტეტურულ გეგმარებითი დავალება - კვლევა) Development regulation plan of St. in Marneuli (architectural planning assignment - research)	2023 წ.	მ. ბოლქვაძე M.Bolqvadze	
	საცხოვრებელი ბინის ინტერიერის დიზაინი ვაშლიჯვარში;	2021 წელი.	შ. გელაშვილი Sh. Gelashvili	

	Interior design of a residential apartment in Vashlijvari; 2021 year.			
	ინდივიდუალური საცხოვრებელი სახლის ინტერიერის დიზაინი საგურამოში *Interior design of a residential apartment in Saguramo. 2021*	2021 წელი.	შ. გელაშვილი Sh. Gelashvili	
	ინდივიდუალური საცხოვრებელი სახლის ინტერიერის დიზაინი დიღომში, ბარათაშვილის ქუჩაზე; *Interior design of an individual residential house on Baratashvili Street in Digomi; 2021 year.*	2021 წელი.	შ. გელაშვილი Sh. Gelashvili	
	ინდივიდუალური საცხოვრებელი სახლის ინტერიერის დიზაინი წავკისში. *Interior design of an individual residential house in Tsavkisi. (with M. Khvedeliani) 2021.*	2021 წელი.	შ. გელაშვილი მ. ხვედელიანი Sh. Gelashvili	(მ. ხვედელიანთან ერთად)

	კაფე „მალონგო“ ქ. თბილისში, აბაშიძის ქუჩა #38 ინტერიერის დიზაინი *Cafe "Malongo" st. Abashidze Street #38, Tbilisi, interior design (with M. Khvedeliani) 2021.*	2021 წელი.	შ. გელაშვილი მ. ხვედელიანი Sh. Gelashvili	(მ. ხვედელიანთან ერთად)
	ინდივიდუალური საცხოვრებელი სახლის არქიტექტურლი პროექტი დიღომში. *Architectural project of an individual residential house in Dighomi. 2021 year.*	**2021 წელი.**	შ. გელაშვილი Sh. Gelashvili	
	სამშენებლო კომპანია „მეგა ჰოლდინგის“ საოფისე ფართის ინტერიერის დიზაინი *Interior design of the office space of the construction company "Mega Holding" 2022.*	**2022 წელი.**	შ. გელაშვილი Sh. Gelashvili	
	ინდივიდუალური საცხოვრებელი სახლის ინტერიერის დიზაინი დიღომში, ბარათაშვილის ქუჩაზე; *Interior design of an individual residential house on Baratashvili Street in Digomi; 2022 year.*	2022 წელი.	შ. გელაშვილი Sh. Gelashvili	
	საცხოვრებელი ბინის ინტერიერის დიზაინი დიდუბეში (მეგა დიდუბე) *Interior design of residential apartment in Didube (Mega Didube) 2022.*	2022 წელი.	შ. გელაშვილი Sh. Gelashvili	

	საცხოვრებელი ბინის ინტერიერის დიზაინი თამარაშვილის ქუჩაზე. *Interior design of a residential apartment. Tamarashvili street. 2022 year*	2022 წელი	შ. გელაშვილი Sh. Gelashvili	
	საცხოვრებელი ბინის ინტერიერის დიზაინი საბურთალოზე *Interior design of a residential apartment.* *Tbilisi, Saburtalo. 2022 year*	2022 წელი	შ. გელაშვილი Sh. Gelashvili	
	საცხოვრებელი ბინის ინტერიერის დიზაინი ქ.თბილისში, ვაკეში. (მიმდინარე) *Interior design of a residential apartment. Tbilisi, Vake. in progress*	2023	შ. გელაშვილი Sh. Gelashvili	
	ინდივიდუალური საცხოვრებელი სახლის ინტერიერის დიზაინი დიღომში, ბარათაშვილის ქუჩაზე; *Interior design of an individual residential house on Baratashvili Street in Digomi; 2021 year.*	2021 წელი.	შ.გელაშვილი Sh. Gelashvili	შ.გელაშვილი
	საცხოვრებელი ბინის ინტერიერის დიზაინი ქ.თბილისში, ჭავჭავაძის გამზირზე *Interior design of a residential apartment in Tbilisi, Chavchavadze Avenue, 2021.*	2021 წელი.	შ. გელაშვილი Sh. Gelashvili	

	ინდივიდუალური საცხოვრებელი სახლის არქიტექტურული პროექტი ოქროყანაში *Architectural project of an individual residential house in Okrokana (together with T. Chigogidze) 2021*	2021 წელი	შ.გელაშვილი თ. ჩიგოგიძე Sh. Gelashvili	შ.გელაშვილი თ. ჩიგოგიძე
	შპს „დუგლაძეების ღვინოების კომპანია " ადმინისტრაციული შენობის არქიტექტურული პროექტი ქ.თბილისში. 2022 წელი. *Architectural project of administrative building of Dugladze Wine Company LLC in Tbilisi. (with N. Khvedeliani and M. Khvedeliani) 2022.*	2022 წ.	შ. გელაშვილი Sh. Gelashvili	(ნ. ხვედელიანთან და მ. ხვედელიათან ერთად)
	ღვინის ქარხნის რეკონსტრუქცია - რეაბილიტაცია გურჯაანში მიმდინარე. *Winery reconstruction-rehabilitation in Gurjaani (with N. Khvedeliani and M. Khvedeliani) in progress.*	2023 წ.	შ. გელაშვილი Sh. Gelashvili	შ. გელაშვილი(ნ. ხვედელიანთან და მ. ხვედელიათან ერთად)
	შ.პ.ს „ელიტ ზურგოვანი დეველოპმენტი"-ს ორი ინდივიდუალური ორბინიანი საცხოვრებელი სახლი, სოფელ ზურგოვანაში. წელი. *Two individual two-room residential houses in Zurgovani (with N. Khvedeliani and M. Khvedeliani) 2023*	2023	შ. გელაშვილი Sh. Gelashvili	(ნ. ხვედელიანთან და მ. ხვედელიათან ერთად)

	ინდივიდუალური ერთბინიანი საცხოვრებელი სახლი დაბა წყნეთში *Individual one-room residential house in Daba Tskneti (with N. Khvedeliani and M. Khvedeliani) 2023*	**2023 წელი.**	შ. გელაშვილი Sh. Gelashvili	(ნ. ხვედელიანთან და მ. ხვედელიათან ერთად)
	ინდივიდუალური ერთბინიანი საცხოვრებელი სახლი სოფელ არაშენდაში. (ნ. ხვედელიანთან და მ. ხვედელიათან ერთად) *Individual one-room residential house in Arashenda (with N. Khvedeliani and M. Khvedeliani) 2023*	**2023 წელი.**	Sh. Gelashvili	
	მრავალფუნქციური მრავალბინიანი საცხოვრებელი კომპლექსი ქ. გორში. (მიმდინარე) *Multi-functional multi-apartment residential complex in Gori. in progress.*	2023 წ.	შ. გელაშვილი Sh. Gelashvili	**შ. გელაშვილი**
	,,ქალაქ ფოთის საკათედრო ტაძარი-ისტორია და ხუროთმოძღვრება“ Poti Cathedral History and Architecture"	2021 - 2024	თ.ჩუბინიძე T.Chubinidze	**თ. ჩუბინიძე ნ. ჩიჩილიძე T.Chubinidze N.Chichilidze**
	,,მუდმივობის ინსტიტუტები,სიმკაცრის დესტილაცია: ახალ კლასიკურ არქიტექტურაში „	2022 - 2024	თ. ჩუბინიძე T.Chubinidze	**თ. ჩუბინიძე მ. ბენაშვილი T.Chubinidze**

	"Institutions of Permanence, Distillation of Rigor: in New Classical Architecture"			**M.benashvili**
	62 საგურამო ილია ჭავჭავაძეს მუზეუმის მიმდებარედ . კერძო სახლის ეზოს დენდროპროექტი,რეალიზაცია (მიმდინარე) 2023წ 62 Saguramo next to Ilia Chavchavadze Museum. yard of a private house Dendro project, realization	(ongoing) 2023	ლ. ქესანაშვილი L. Qesanashvili	**ლ. ქესანაშვილი** **L. Qesanashvili**
	61 ქ. თბილისი, პეტრე მელიქიშვილის ქ. 47-49-49ა. კერძო ბინის დიზაინ-პროექტი,რეალიზაცია. 2023წ(მიმდინარე) 61 St. Tbilisi, Petre Melikishvili st. 47-49-49a. Design project of a private apartment - realization.	2023 (current)	ლ. ქესანაშვილი L. Qesanashvili	**ლ. ქესანაშვილი** **L. Qesanashvili**
	60 ქ. თბილისი, ნიკიფორე ირბახის ქ. კომპლექსი „მოედანი“ ბ.49 კერძო ბინის დიზაინ-პროექტი, რეალიზაცია.(მიმდინარე) 2023წ 60 St. Tbilisi, Nikifore Irbachi st. "Moedani" complex, b. 49, design project of a private apartment, realization. (ongoing)	2023	ლ. ქესანაშვილი L. Qesanashvili	**ლ. ქესანაშვილი** **L. Qesanashvili**
	59 ქ. თბილისი, გორგასლის 34. (კერძო ბინის დიზაინპროექტი-რეალიზაცია)-2023წ (დასრულებული)59 St. Tbilisi,	2023	ლ. ქესანაშვილი L. Qesanashvili	**ლ. ქესანაშვილი** **L. Qesanashvili**

	Gorgasli 34. (Design project of a private apartment - realization) - (completed) 58 ქ. თბილისი, აკაკი წერეთლის გამზირი 45 „წერეთელი თაუერსი“ (დენდროპროექტი)-2023წ 57 ქ. თბილისი, ანდრონიკაშვილის ქ. 61 (დენდროპროექტი) -2023წ 56 ქ.თბილისი რაზმაძეს ქ. 54. ქ. რაზმაძე 56-ის მიმდებარედ, ქ. რაძმაძე 56 – (დენდროპროექტი)-2023წ. 55 ქ.თბილისი გ. საკაძის დაღმართი. დამკვეთი „საკაძე დეველოპმენტი“ - დენდროპროექტი 54. ქ. თბილისი, ქერჩის ქ. 6ა-ს მიმდებარედ. (დენდროპროექტი) 2023წ 53 ქ.თბილისი.ა. ყაზბეგი 21, „პროკრედიტბანკი“ ტერასის კეთილმოწყობის პროექტი-რეალიზაცია2023წ (მიმდინარე) 52. ქ.თბილისი, ლისის ტბის მიმდებარედ ს/კ 01.14.16.014.054.დამკვ. შ.პ.ს. „გეოკურიერი“ (დენდროპროექტი, რეალიზაცია)2023წ(დასრულებული) 58 St. Tbilisi, Akaki Tsereteli Ave. 45 "Tsereteli Towers" (dendro project)-			

	57 St. Tbilisi, Andronikashvili st. 61 (dendro project) - 56 Tbilisi Razmadze st. 54. st. near Razmadze 56, st. Radzmadze 56 - (dendro project) 55 Tbilisi city The descent of Saakadze. Customer "Saakadze Development" - dendro project 54. st. Tbilisi, Kerchi st. Adjacent to 6a. (dendro project) 53, Tbilisi, A. Kazbegi 21, "Procreditbank" terrace improvement project - realization 52. City of Tbilisi, adjacent to Lisi lake, road 01.14.16.014.054. Damkv. Ltd. "Geocourier" (dendro project, realization) (completed)			
	51. ქ.თბილისი, შ. პეტეფის ქ. 50-ის მოპირდაპირედ.(დენდროპროექტი) 2022წ 50. ქ. თბილისი, დასახლება ვაზისუბანი, ნაკვეთი01/048. (დენდროპროექტი) 2022წ 49. ქ.თბილისი, ნუცუბიძის4 მკრ.-ის 2-ე და 3-ე კორპუსის მოპირდაპირედ.(დენდროპროექტი) 2022 48. ქ.თბილისი, ცაცხვების4შესახვევი 4. (დენდროპროექტი)2022წ	2022	ლ. ქესანაშვილი L. Qesanashvili	**ლ. ქესანაშვილი** **L. Qesanashvili**

	47 ქ. თბილისი, კახეთის გზატკეცილი 44, ნაკვეთი12/49. (დენდროპროექტი) 2022წ 46. ქ. თბილისი, წინამძღვრიშვილის ქ. 133ა. (დენეროპროექტი) 2022წ 45 ქ.თბილისი, ლისი ტოპოგრაფი,სექტორი 13, ნაკვეთი172, (დენდროპროექტი) 2022წ 44. ქ.თბილისი, ორხევი,ჩანტლაძის ქ. სამგორის 5 შესახვევი.(დენდროპროექტი)2022წ 43 ქ.მცხეთა, თხინვალა, ზონა42, სექტორი 16, კვარტალი 23, (დენდროპროექტი)2022წ 42 ქ.თბილისი, ს. დიდი დიღომი(დენდროპროექტი)2022წ. 41 ქ.თბილისი, ტ.თვალჭრელიძის ქ. 10ა (დენდროპროექტი) 2022წ 40 ქ.თბილისი, სოფ.დიღომი, კრისტიან სტივენსის 25, (დენდროპროექტი) 2022წ 39 ქ.თბილისი. მ.გახოკიძეს 54 (დენდროპროექტი) 2022წ 51. Tbilisi, sh. Petef st. Opposite 50. (Dendro project) 50. st. Tbilisi, settlement Vazisubani, plot 01/048. (dendroproject) 49. Tbilisi, opposite the 2nd and 3rd buildings of Nutsubidze 4 Mkr. (dendro project)			

	48. Tbilisi, 4 Tsakhevis Lane 4. (Dendro project) 47 St. Tbilisi, Kakheti highway 44, plot 12/49. (dendroproject) 46. st. Tbilisi, Tsinamdvrishvili st. 133a. (Denero Project 45, Tbilisi City, Lisi Topograph, Sector 13, Plot 172, (Dendro project) 44. Tbilisi, Orkhevi, Chantladze st. 5 lanes of Samgori. (dendro project 43 Mtskheta St., Tkhinvala, Zone 42, Sector 16, Quarter 23, (Dendro project) 42 Tbilisi, s. Didi Digomi (dendro project) 41 Tbilisi St., T. Tvalchrelidze St. 10a (dendro project) 40 Tbilisi city, Digomi village, Christian Stevens 25, (dendro project) 39, Tbilisi. M. Gakhokidze 54 (dendro project) 2022			
		2022		
	38. ქ.თბილისი. ბუხაიძეს 2-ე შესახვევი 6ა (დენდროპროექტი)2022წ 37. ქ.თბილისი,ბუხაიძე 48. დენდროპროექტი (2022ქ) 36. კერძო ბაღი, თბილისი, მ. დადიანი-ანჩაბაძის 13, (დენდროპროექტის დამუშავება და რეალიზაცია.) 2021. 38. Tbilisi. Bukhaidze 2nd lane 6a (dendro project)	2022	ლ. ქესანაშვილი L. Qesanashvili	**ლ. ქესანაშვილი** **L. Qesanashvili**

	37. Tbilisi, Bukhaidze 48. Dendro project	(2022)	ლ. ქესანაშვილი L. Qesanashvili	**ლ. ქესანაშვილი** **L. Qesanashvili**
	35. ქ. თბილისი. ქ. ჯიქია 9. (დენდროპროექტი) 2021წ. 34. ქ.თბილისი, წულაძის ქ. 34, (ბერი გაბრიელ სალოსის ქ.) (დენდროპროექტი) 2021წ. 33. ქ. თბილისი, ლისის ტბის მიმდებარედ, ნაკვ.09/066, (დენდროპროექტი) 2021წ. 35. st. Tbilisi. St. Jikia 9. (dendro project) 2021 34. Tbilisi, Tsuladze st. 34, (Beri Gabriel Salosi st.) (dendro project) 2021 33. st. Tbilisi, near Lisi Lake, plot 09/066, (dendro project)	2021.	ლ. ქესანაშვილი L. Qesanashvili	**ლ. ქესანაშვილი** **L. Qesanashvili**
	32. ქ. თბილისი, ბოჭორიშვილის ქ.25-ის მიმდებარედ. (დენდროპროექტი), 2020წ. 31. ქ. თბილისი, სოფ. ზურგოვანი, ასი ათასი მოწამეს ქ. 28, (დენდროპროექტი) 30 ქ. თბილისი, სოფ. შინდისი (დენდროპროექტი) 2020წ. 29 ქ. თბილისი, სოფ. კიკეთი, 2 საცხოვრებელი სახლის მიმდებარე ტერიტორიის დენდროპროექტი 2020წ. 28. ქ. თბილისი, სოფ. დიღომი, დავარის ქ. (დენდროპროექტი)2020წ. 27. ქ. თბილისი, ასმათის ქ. 12,	2020.	ლ. ქესანაშვილი L. Qesanashvili	**ლ. ქესანაშვილი** **L. Qesanashvili**

	(დენდროპროექტი) 2020წ. 26. ქ. თბილისი, ბელიაშვილის ქ. მიონის მოპირდაპირედ, (დენდროპროექტი)2020წ. 25. ქ. თბილისი, ირაკლი გამრეკელის ქ. 35ა, (დენდროპროექტი) 2020წ. 32. st. Tbilisi, near Bochorishvili St. 25. (dendro project), 31. st. Tbilisi, village Dorsovani, St. of One Hundred Thousand Martyrs. 28, (dendro project) 30 St. Tbilisi, village Shindis (dendro project) 29 St. Tbilisi, village Kiketi, dendro project of the area surrounding 2 residential houses in 28. st. Tbilisi, village Digomi, Davari st. (dendro project) 2020 27. st. Tbilisi, Asmati st. 12, (dendro project) 26. st. Tbilisi, Beliashvili st. Opposite Mion, (dendro project) 25. st. Tbilisi, Irakli Gamrekeli st. 35a, (dendro project)			
	24. ქ.ფოთის ცენტრალური კულტურისა და დასვენების პარკის . საკონკურსო პროექტის კონცეპტუალური გადაწყვეტა. 2019. 23. სოფ. კიკეთი. ტაძრის ტერიტორიაძე ბაღის პროექტი 2019წ.	2019.	ლ. ქესანაშვილი L. Qesanashvili	ლ. ქესანაშვილი L. Qesanashvili

	22. კერძო ბაღი, თბილისი, ქოშიგორაზე, უდაბნოს მონასტრის 1 შესახვევი, (დენდროპროექტის დამუშავება და რეალიზაცია.) 2019. 21 კერძო ბაღი , წავკისი, დავით აღმაშენებლის 4-ე შესახვევი №3, (დენდროპროექტის დამუშავება), 2019, 20 ქ. თბილისი, ნუცუბიძე 4მკრ. (ნაკვ.42) (დენდროპროექტი) 2019წ. 19 ქ. თბილისი, ჩერქეზიშვილის ქ. 19, ნაკვ. 11/7, (დენდროპროექტი) 2019წ. 18 ქ. თბილისი, ს. დიღომი, ასმათისქ. 1, (დენდროპროექტი)2019წ. 17 ქ. თბილისი, მ. წინამძღვრიშვილის ქ.113. (დენდროპროექტი)2019წ. 16 ქ. თბილისი. ვაჯა-ფშაველას გამზ. (ყოფილი სასტუმრო აფხაზეთი) 25. (დენდროპროექტი)2019წ. 24. Poti Central Culture and Recreation Park. Conceptual solution of the competition project. 23. village good The project of the Tereitadze garden of the temple in 22. Private garden, Tbilisi, on Koshigora, 1 lane of Udabno Monastery, (Dendro project development and realization.) 21 private garden, Tsavkis, Davit Agmashenebeli 4th lane No. 3, (Dendro project processing), 16 St. Tbilisi. Vaja-Pshavela Ave. (Former Hotel Abkhazia) 25. (Dendro project)			

	8 კერძი ბაღი, შინდისი, ტიციან ტაბიძის №16, (დენდროპროექტი და რეალიზაცია), 2018, 7 კერძო ბაღი, კიკეთი, სამპანტების 1 შესახვევი, (დენდროპროექტი და რეალიზაცია), 2018, 6 ქ. თბილისი, წერეთლის გამზ.4, (დენდროპროექტი) 2018წ. 5 ქ. თბილისი, ვარკეთილი 2-ის 1მკრ. ნაკვ.41, (დენდროპროექტი)2018წ. 4 ქ. თბილისი. კახეთის გზატკეცილი, 44, (დენდროპროექტი) ნ2018წ. 3 ქ. თბილისი, ბუხაიძის ქ. (დენდროპროექტი) 2018წ. 2 ქ. თბილისი, ვაშლისჯვარი, გოძიაშვილის მე-2-ე შესახვევი, მაჭავარიანის ქ, (დენდროპროექტი)2018წ. 1 ქ. თბილისი, შავგულიძის 9, (დენდროპროექტი) 8 Dishes Garden, Shindisi, Titsian Tabidze №16, (Dendro project and realization), 7 private gardens, Kiketi, 1 Sampantes lane, (dendro project and realization), 2018, 6 St. Tbilisi, Tsereteli Ave. 4, (dendroproject) 2018. 5 St. Tbilisi, Varketili 2, 1 sq.m. Plot 41, (dendro project) 2018 4 St. Tbilisi. Kakheti highway, 44, (dendro project) N2018.	2018,	ლ. ქესანაშვილი L. Qesanashvili	**ლ. ქესანაშვილი** **L. Qesanashvili**

	3 St. Tbilisi, Bukhaidze st. (Dendro project) 2018 2 St. Tbilisi, Vashlisjvari, Godziashvili 2nd Lane, Machavariani Street, (Dendro project) 2018. 1 St. Tbilisi, Shavgulidze 9, (dendro project)			
	1. სივრცით-ტერიტორიული დაგეგმარების დოკუმენაციების შემუშავება საქართველოს 4 მუნიციპალიტეტისა და 32 დასახლებისთვის 2018-2023 წწ. (დოკუმენტაციის შექმნაში მონაწილეობას იღებდნენ სტუდენტები) Development of spatial-territorial planning documentation for 4 municipalities and 32 settlements of Georgia in 2018-2023. (Students participated in the creation of the documentation)	2018 - 2023	ნ. გვენცაძე N. Gventsadze	ნ. გვენცაძე N. Gventsadze
	შენობების ენერგოეფექტურობა. **Energy efficiency of buildings.**	2018 - 2024	ლ. ბერიძე L. Beridze	ლ. ბერიძე L. Beridze

	“აჭარის ხის მეჩეთების არქიტექტურულ-მხატვრული ანალიზი”. "Architectural-artistic analysis of wooden mosques of Adjara".	2021	მ. ძიძიგური M. Dzidziguri	**მ. ძიძიგური** **ნ. კვაჭაძე** **M. Dzidziguri** **N. Kvachadze**
	ლოჯისტიკური ცენტრების არქიტექტურულ-გეგმარებითი თავისებურებათა კვლევა - Research of architectural and planning features of logistics centers -	2019 - 2022	ნ. იმნაძე N. Imnadze	**ნ. იმნაძე** **ი. ქამუშაძე** **N.Imnadze** **I. Qamushadze**
	დამალული ურბანიზმი - მეტროს სადგურების არქიტექტურა, როგორც მხატვრულ-ესთეტიკური კატეგორია; Hidden urbanism - the architecture of metro stations as an artistic-aesthetic category;	2019 - 2023	ნ. იმნაძე N. Imnadze	**ნ. იმნაძე** **გ. კორძაია** **N. Imnadze** **G. Kordzaia**
	არქიტექტურის მხატვრულ-ესთეტიური და ფუნქციური თავისებურებათა კვლევა ტურისტულ ინდუსტრიაში კახეთის და ქართლის მაგალითზე; Research of artistic-aesthetic and functional features of architecture in the tourism industry on the example of Kakheti and Kartli;	2019 - 2022	ნ. იმნაძე N. Imnadze	**ნ. იმნაძე** **გ. ვარდოსანიძე** **N. Imnadze** **G. Vardosanidze**
	ქ.ქუთაისის მე-19 საუკუნის განაშენიანების რესტავრაცია-ადაპტაციის მეთოდოლოგიის შემუშავება ქალაქის განვითარების კონტექსტში;	2020 - 2023	ნ. იმნაძე N. Imnadze	**ნ. იმნაძე** **გ. გოგრიჭიანი** **N. Imnadze** **G. Gogrichiani**

	development of the methodology of restoration-adaptation of the 19th century development of the city of Kutaisi in the context of the city's development;			
	„ურბანული დიზაინის ზეგავლენა ადგილობრივ მიკროკლიმატზე და მაცხოვრებელთა თერმულ კომფორტზე თბილი და ზომიერად ნოტიო კლიმატის პირობებში. კვლევა თბილისის მაგალითზე“. "Impact of Urban Design on Local Microclimate and Thermal Comfort of Residents in Warm and Moderately Humid Climates. Research on the example of Tbilisi".	2021 - 2024	ნ. იმნაძე N. Imnadze	**ნ. იმნაძე** **გ. ვარდანაშვილი** **N. Imnadze** **G. vardanashvili**
	„ანტიმოდერნისტული შემობრუნება საბჭოთა არქიტექტურასა და ურბანულ დიზაინში. თბილისის მაგალითი“. “The Anti-Modernist Turn in Soviet Architecture and Urban Design. The example of Tbilisi".	2022 - 2025	ნ. იმნაძე N. Imnadze	**ნ. იმნაძე** **ლ. ასაბაშვილი** **N. Imnadze** **L. Asabashvili**

Name of the Faculty - Faculty of Business Technologies

Completed projects

№	The name of the completed project, indicating the field of science and scientific direction	Year	Head of the project	Project performers
1	Educational program development - corporate finance (manual lecture course) Field of science - business administration Scientific direction - financial and banking technologies	2019	L. Gvenetadze	L. Gvenetadze, I. Mamaladze
2	"Development and application of business research methodology in qualification papers" Field of science - business administration Scientific direction - financial and banking technologies	2019	Merab Vanishvili	Merab Vanishvili, Medea Chelidze, Valeri Mosiashvili, Nino Khidirbegishvili
3	Bachelor Educational Program "Sustainable Mountain Tourism and Hospitality Management"	2020	Manana Vasadze	Manana Vasadze
4	Project - Stu. "Promoting the realization of entrepreneurship among young students in the regional perspective on the example of Kvemo Kartli"	2020	N. Tchanturia	N. Tchanturia

Annotation

1. The purpose of the guided lecture course - Basics of Corporate Finance - is to provide undergraduate students with the theoretical and practical knowledge necessary for corporate finance management, to form and develop the ability to use financial technologies in financial and non-financial corporations. It presents the logical continuation of the first-level bachelor's course ("Fundamentals of Corporate Finance") of the academic higher education, the second-level master's course ("Corporate Finance"). The application of the mentioned principle contributes to the development of the connection between the first and second level of academic higher education and the increase in the effectiveness and efficiency of the teaching process.

Manual - in the lecture course, methodical, methodological issues of corporate finance and practical material are discussed in relation. At the same time, important financial ratios are clearly and easily understood. The combination of theoretical and practical material will in turn help students to study corporate finance in depth and discuss effective financial solutions. In each chapter, the issues are covered in a consistent and systematic manner, and important provisions are highlighted in bold.

2. Within the framework of the research project, the main Georgian and foreign information sources and literature needed for the research were searched, studied and critically evaluated. In the training-practical guide, in order to simplify the presentation of the text, to make it easy to understand and assimilate, each topic is divided into specific issues of independent importance. In addition, at the end of each topic, there are control questions/tasks and closed tests, which provide an opportunity to verify the quality of mastering the key issues of the topics.

3. The program has an implementation staff renewable on a semester basis
A load chart that includes the appropriate load depending on the duty assigned to them. Program staff are also involved in the consulting and program development process. The educational program is implemented with the support of the university administration and all relevant structural units. The program is directly served by appropriately qualified administrative and support staff who work in the relevant services and structural units of the University of Stu and the Faculty of Business Technologies.

4. In January-March 2021, the project "Promoting the realization of entrepreneurial potential in students-youth in the regional perspective on the example of Kvemo Kartli" was implemented by the professors of GTU, the Department of Business Administration (N. Tchanturia, B.Goderdzishvili, T.Beridze, M.Topchishvili), which aimed to attract students-youth with appropriate potential to study at the Faculty of Business Technologies of GTU. Within the framework of the project, a visit to the schools of the mentioned region was carried out and students were informed about the requirements of the labor market and the educational programs of the Faculty of Business Technology of GTU. There was also a sharing of educational methodical experience for students and teachers.

International Design School
Projects implemented in 2018-2023

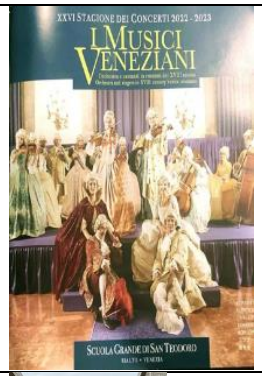
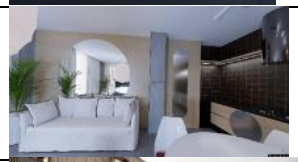
№	The name of the implemented project, according to the field of science and scientific direction	Year	Head of the project	Project performers
1	Planning of space development and development management of Batumi municipality. 07.31. Architecture and urban planning.	2021-2023	Mamuka Salukvadze	Leading specialist Nikoloz Shavishvili. City planner – Christof Raymond; Urbanist - Stefan Vladyka
2	Field archeological research at Samarovani and Nakalakari of Okherakhevi (Mtskheti Municipality, Nichbisi). 0222.1.2. Archaeology;	2022	Alexandre Noneshvili	Alexandre Noneshvili, T. Bibiluri, I. Bibiluri K. Pachoshvili
3	Topographical planning of the territory of Telavi's "Lord's Castle" (Kakheti). 0222.1.2. Archaeology;	2022	Alexandre Noneshvili	Alexandre Noneshvili

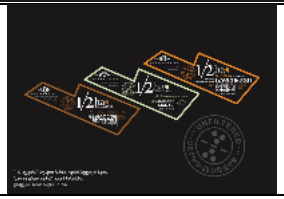
4	Field archaeological research-exploration in Nichbis, Okherakhevi Samarovani and Nakalakari. 0222.1.2. 0222.1.2. Archaeology;	2021	Alexandre Noneshvili	Alexandre Noneshvili შ. ირემაშვილი, T. Bibiluri, I. Bibiluri, K. Pachoshvili
5	"The decision-making process in gambling and the factors affecting it (the example of Georgia) - PHDF-21-3954. Social Sciences	2020-2021	Boris Lezhava	Anna Elizarova
6	Urban planning and architecture: multi-apartment residential complex "White Square Nutsubidze", st. Tbilisi, Nutsubidze st. 125a, development regulation plan and detailed planning 07.31. Architecture and urban planning.	2019-2020	Alexandre Mgaloblishvili	Alexandre Mgaloblishvili, Lasha Kobulia, Mariam Samarganishvili
7	The report of the archaeological survey carried out in 2019 in the construction zone of the Tedzami reservoir and in the area surrounding the construction. 0222.1.2. 0222.1.2. Archaeology;	2020 წ.	Alexandre Noneshvili	Alexandre Noneshvili Temur Bibiluri, Ivane Bibiluri, K. Pachoshvili
8	Archaeological excavations of the Basilica of Nedzvi (9th century) located in the territory of the Borjomi-Kharagauli nature reserve. 0222.1.2. Archaeology;	2018	Alexandre Noneshvili	Alexandre Noneshvili

International Design School

Artistic, design, and architectural projects implemented in 2018-2023

№	The name of the implemented project, according to the field of science and scientific direction	Photo	Year	Project performers
1	Group exhibition "June in Bologna" organized by ArteBo Gallery June 11-25 Bologna Italy 2022		2022	Maia Nanobashvili
2	Digital Exhibition Week of Women Artists June 14--20, International Contemporary Art Festival, ARTERIA XIX, organized by ITACA and Institucion Ferial di Monzon. Aragon, Spain		2022	Maia Nanobashvili
3	ARTE BOOK ITACA 2022 - a printed catalog of the works of artists associated with the organization ITACA was published		2022	Maia Nanobashvili

4	FERRO DI PRUA Organization International group exhibition of artists of ITACA "Scuola Grande di San Teodoro" presented the work "Treasure", March 12-17 Venice, Italy https://youtu.be/vuEyu1-K3YA		2022	Maia Nanobashvili
5	Project “ Second Life Light” Awarded Plastic Prize 2022		2022	Mariam Samarganishvili
6	Multipurpose building. Tbilisi. Ketevan Dedofli Ave		2022	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili, A. Sulaberidze
7	Hotel-apartments. Tbilisi. Kereselidze st.		2022	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili, A. Sulaberidze
8	Individual residential house. Tbilisi. near Lisi		2022	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili, A. Sulaberidze

9	Development regulation plan. Tbilisi		2022	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili, A. Sulaberidze
10	Residential complex in Didi Dighomi, Tbilisi		2022	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili, A. Sulaberidze
11	UNDP Georgia Service Center, Asatiani St., Tbilisi		2022	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili, A. Sulaberidze
12	Zedavela. Restyling of the trademark. Sparkling wine packaging and graphic identity. Customer "Solargroup Georgia"		2022	Giorgi Khatiashvili
13	"1/2 acre". Trademark, wine packaging series. Designation/sign of "unfiltered wine". Client "Kashmi Hills"		2022	Giorgi Khatiashvili

15	Palette Studio. Trademark and graphic identity. Customer "Palitra Holding"		2022	Giorgi Khatiashvili
16	Zedavela. A series of Gori and Kartli wine labels. Customer "Solargroup Georgia"		2022	Giorgi Khatiashvili
17	Cryspy Layers. Trademark and graphic identity. The customer is incognito.		2022	Giorgi Khatiashvili
18	Apartment building. Politkovskaya 22, Tbilisi		2021	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili, A. Sulaberidze
19	Individual residential house. near Lis. Tbilisi		2021	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili, A. Sulaberidze
20	Individual residential house. near Lisi. Tbilisi		2021	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili, A. Sulaberidze

22	Individual residential house. saguramo		2021	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili, A. Sulaberidze
23	Khalik Bank Central Branch. Kostava St., Tbilisi.		2021	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili, A. Sulaberidze
24	Individual residential house. near Lisi. Tbilisi		2021	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili, A. Sulaberidze
25	Individual residential house. Koshigora. Tbilisi		2021	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili, A. Sulaberidze
26	Individual residential house. Okrokana, Tbilisi		2021	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili, A. Sulaberidze
27	სასტუმროს სარეკრეაციო სივრცე. თბილისი		2021	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili, A. Sulaberidze

28	Individual residential house. Tskneti		2021	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili, A. Sulaberidze
29	The exhibition Parallel, a circle of humanity -- the permanent collection of the Imago Mundi art fund is represented according to the countries where my work "Map of Georgia" is presented in the organization Openness and Dialogue OOD (Center of Openness and Dialogue) November 12, December 31, 2021 Tirana, Albania		2021	Maia Nanobashvili
30	Organization ITACA International Group Exhibition of Artists, Galerie Artes, Rue Frédéric Souton Paris France Certified Member Exhibition October 10-19 Official Opening October 14, 2021		2021	Maia Nanobashvili
31	ARTE BOOK ITACA - the printed catalog of the artists associated with the organization ITACA also devotes several pages to my works and concepts Book presentation May 12-19 Madrid Spain 2021		2021	Maia Nanobashvili
32	Digital Exhibition Week of Women Artists May 27 - June 2, 2021 The project was implemented with the support of Creative Europe		2021	Maia Nanobashvili

	and Tbilisi City Hall, a certified member, Georgia			
33	exhibition catalog; https://issuu.com/womenbusinesscouncilingeorgia/docs/1isuee_prof		2021	Maia Nanobashvili
34	• UNDERTOW 2.0 – Gallery OpenArtExchange online international group exhibition. 10 April-10 May 2021 Hoogstadt, Skiddam Netherlands. • Exhibition link https://www.openartexchange.com/event/undertow-2-0/		2021	Maia Nanobashvili
35	International Women's Group Exhibition -- March 4-17, 2021 -- Supported by the Palace of Culture of Monzon - Monzon, Aragon, Spain		2021	Maia Nanobashvili
36	Rugby Union. Logo.		2021	Giorgi Khatiashvili

37	Rugby Union. Black lion emblem.		2021	Giorgi Khatiashvili
38	Rugby Union. The uniform of the Georgian national team.		2021	Giorgi Khatiashvili
39	V.I.D.A. – (Virtual International Development of ART) the first virtual exhibition of international artists		2020	Maia Nanobashvili
40	Penelope does not Wait"--an international exhibition dedicated to women--"NAUART" Gallery"-8 Barcelona, Spain.		2020	Maia Nanobashvili
41	,, Exposition Presentation of ITACA”--exhibition		2020	Maia Nanobashvili
42	"Iberia" - international collaborative project Spain -- Prado Goyart and art tour - ITACA -- and Georgia Gallery Art Space		2020	Maia Nanobashvili
43	"For The Fraternity" — a group exhibition of international artists, Gallery Montjuï, Barcelona, Spain		2019	Maia Nanobashvili
44	"Fourth group exhibition of permanent partner artists of Goyart Gallery"		2019	Maia Nanobashvili

45	Art Festival Arteria", "Art Festival Arteria"- international exhibition festival. Barcelona, Spain		2019	Maia Nanobashvili
46	"Salon Primavera Goyart" "Salon Primavera Goyart" -- international group exhibition in cooperation with Prado Goyart Gallery.		2019	Maia Nanobashvili
47	International exhibition dedicated to the female characters of Miguel de Cervantes' "Don Quixote" Capuchin Palace, Toledo, Spain		2019	Maia Nanobashvili
48	Residential complex in Tbilisi, on Nutsubidze Street			M. Samarganishvili, L. Kobulia, A. Mgaloblishvili,
49	Nut processing enterprise village of Ennis		2020-2021	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili,
50	Multipurpose complex Tbilisi. Ketevan Dedofli st.		2020-2021	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili,
51	Khalik Bank office, Tbilisi. Chavchavadze Ave.		2020	M. Samarganishvili, L. Kobulia, A. Mgaloblishvili,
52	Considering the Georgian climate, studying the software to model passive house design and energy consumption requirements. This		2019	Paul Robert Querrel

	software will be a general application for the construction of eco-design buildings throughout Georgia.			
53	Visualization project for eco-house design in SketchUp.		2019	Paul Robert Querrel
54	ახალი სასტუმრო „გრაფიკა თბილისი“-ს ვებსაიტისა და სოციალური მედიის შექმნა.		2019	Paul Robert Querrel
55	A complete update of the already existing trilingual website of the Cruise Hotel.		2019	Paul Robert Querrel
56	Creation of website and social media of "Argo" restaurant.		2019	Paul Robert Querrel
57	Updating the already existing trilingual website of Laerton Tbilisi Hotel (www.laerton-hotel.com) - adding the online booking function.		2019	Paul Robert Querrel
58	Adding various products to the existing website of "Old Lami" LLC and updating the site (www.oldlami.com)		2019	Paul Robert Querrel
59	Complete update of the existing website of the English-Georgian Translation Bureau - creation of a responsive site (www.english-georgian.ge)		2019	Paul Robert Querrel
60	Trilingual website of "Arkadone" LLC (www.arkadone.ge)		2018	Paul Robert Querrel

61	Trilingual website of "Laerton Tbilisi" LLC (www.laerton-hotel.com)		2018	Paul Robert Querrel
62	Tbilisi II International of Traditional Craft and Design Summit "Ethnofest - 2018"		2018	მამუკა ხოშტარია
63	Hotel "Tuta" facade decoration. Tbilisi. Georgia		2018	Giorgi Khatiashvili
64	creative union Ltd. "Stromboli" Tbilisi. Georgia. Calligraphic trademark and signature style		2018	Giorgi Khatiashvili
65	JSC "Liberty Bank" Tbilisi. Georgia. Latin logotype Transfer to Georgia.		2018	Giorgi Khatiashvili
66	"Frankfurt International Book Fair" Frankfurt. Germany. copyright calligraphic sign.		2018	Giorgi Khatiashvili

67	"Frankfurt book international fair" Frankfurt. Germany. Georgian authors typographic works Publication in the catalog		2018წ.	Giorgi Khatiashvili

Faculty of Engineering Economics, Media Technology and Social Sciences

Faculty of Engineering Economics, Media technologies and Social Sciences

Projects

№	Name of the projects, indicate scientific field and direction	Year	The head of the project	Person(s) implemented the project

1	Challenges of a Democratic State governed by the Rule of Law under COVID-19” (financed by the Ministry of Education and Science under the "Social Responsibility of Science" program)	2022-2024 ongoing	Prof. Agneshka Nogal, M. Beriashvili	Professors and of Warsaw University , GTU Phd. Mariam Khazaradze , K. Rcheulishvili, Irakli Taboridze, David Galashvili
2	Pridrich Hegel “Philosophy of Right“- translation project	2021-2023	Prof. M. Beriashvili	Gioa Baramidze , Mariam Khazaradze
3	The mechanism of the evolution of gender stereotypes and the main factors	2021	Iasha Kutubidze	Vazha Gurgenidze, Vsofio Pachulia, Nato Makhatadze

	Social Sciences, Sociology, Ethnology, Social Issues (Women and Gender Studies, Social Issues, Family Studies, Social Work)			
4	Project teaching of German as a foreign language at the Technical University of Georgia (presentation: cafe-discussion mode)	2022	working group of IDT Department: Project-oriented learning, supervisors (K. Siebold, F. Thaler) University of Vienna	Ia Burduli
5	“Poland-Georgia Science . 2022" 3 month research visit to Poland – M. Beriashvili, K.	2022	Prof. Zdislav Krasnodebski	M. Beriashvili, K. Rcheulishvili,, M. Khazaradze

	Rcheulishvili,, M. Khazaradze			
6	The genesis of Georgia European orientation The research was financed by Shota Rustaveli National Science Foundation of Georgia	2018-2022	Emzar Pazhava	Emzar Pazhava
7	European Idea and Georgia's European Integration Erasmus + Jean Monnet Module	2019-2022	Emzar Pazhava	Oliver Raisner, Nugzar Bardavelidze, Liza Amilakhvari
8	Open Society financed from President's fund" "Summer school in Sairme for	2019	Prof. M. Beriashvili	Invited professors: Niklaus largier, Andreas Arndt, masters and Phd. students from

	masters and Phd. students "Justifies State as moral State			Zugdidi and Kutaisi
9	Enhancing Women's Entrepreneurial Capabilities in Georgia,	2020	D.Sekhniashvili	D.Sekhniashvili
10	Conrad Adenauer Fund and GTU mutual project : masters and Phd. colloquium at Lopota lake 23-28.02.2021, "Human Rights – goal and challenge in democratic society	2022	Prof. Teo Kobush, M. Beriashvili, Iorg Hard	Invited foreign professors: Teo Kobush, Andreas Ardt. Iorg Hard, GTU professors M. Beriashvili
11	Economics of Firms	2018 1 May- 2020 1 May	Sichinava	Irine mamaladze, D. Sekhniashvili A. Gvarutsidze, Giorgi Shengelia

				, M. Gabisonia D. Gegia Ekaterine Chitishvili
12	GTU, Zugdidi state University and Kutaisi State University mutual project "State Policy, Religion, 27-30/01/2018 Kutaisi **Financed by A. Tsereteli University: Fund Open Society Georgia**	2018	Prof. Iohanes Vais, M. Beriashvili	**Speakers:** Iohanes Vais , M. Beriashvili, E. Djgerenaia M. Okudzava and members of educational scientific cluster's members
13	Archaeological expedition of Nakalakari Guria-Vashnari Tender of the National Agency for	2022	V.Sadradze M.dzneladze	**National Museum Philanthropic Foundation, Gtu-Department of Archaeology**

	Cultural Monitoring of Georgia (contract August 09, 2022 #1-186-22 Vol.)			**and History**
14	Village Amlevi municipality of Tetritskaro . GTU student archaeological expedition	2021	V.Sadradze M.dzneladze	**Gtu-Department of Archaeology and History**
15	Actual problems of modern international relations	2019	Manana Darchashvili	Keti Jijeishvili, Maia Kipiani, Lali Kapanadze, Eka Bukhrashvili, Lia Metreveli
16	Enhance of women entrepreneur possibilities in Georgia Project ID code: Nr. 1.-	02.02.2019 - 03.07.2019	D. Sekhniashvili	D. Sekhniashvili

	50.3/3796, Education Development State Agency , Latvian research 2018/2019 Latvia			
17	Digital Economics abnd and management	2019	G. Jolia	I. Dzangavadze
18	Georgia's European world (XVII century 70–XVIII Georgian study sciences Hunmanitarian sciences	2017 - 2021	Zurab Gamezardashvili	KH. Chapichadze, M. Papashvili, E. Mamistvalishvili
19	Idea of European Genesis in	2016-2018	Zurab Gamezardashvili	Murman Papashvili, Nugzar Bardavelidze

	Georgia in-13-18 centuries			მურმან პაპაშვილი, ნუგზარ ბარდაველიძე
20	Assessment of Real Estate	2018	A.Sichinava	D. Sekhniashvili, N. Kutibashvili
21	Economics and management of of Innovative activities	2018	G.Jolia	I. Dzangavadze

1. The project "The process of transformation of the European Union and European states as a result of the impact of crises: problems and challenges" aimed to bring the research and educational processes of Georgian universities participating in the consortium as close as possible to European standards, to deepen collaboration with European and American universities in order to make the research and teaching process more international and interdisciplinary. Within the framework of the project, the understanding of the functioning of the systems of modern democratic (European) societies was carried out from a comprehensive perspective.

2. The translation and editing of the most influential writer of classical German philosophy, G.W.F Hegel's Philosophy of Right into Georgian

3. The paper (textbook) is dedicated to the discussion of “Mechanism and key factors in the evaluation of gender stereotypes” of gender stereotypes in Georgia. The paper presents the possibilities of predicting gender relations and its accompanying shortcomings in parallel with gender policy and the activities of women’s organiozations.

4. Learning and mastering several languages is the EUchallenge these days.
The implementation of the new teaching methods into teaching practice and quality-oriented foreign language teaching is a current goal of the Georgian Technical University. Project-oriented foreign language learning is the new opportunity for the Georgian Technical University, especially in the area of hybrid educational spaces.
Psycholinguistic directions play an important role in project-oriented learning with linear and integrative models in the classroom. In project-oriented learning, the interests of the students are given priority. "I" and "we" are in the foreground. In a role play, a student can take on the role of the moderator or supervisor. With the help of imitated processes, imitated offices, laboratories, workshops, interviews, shows and various programs, the students put theory into practice, they lead the learning process themselves and in this way develop social and action skills, democratic
directions of Western European experiences.
The lessons are based not only on linguistic skills (reading, writing, listening, speaking), but also on regional, scientific, social, political and cultural knowledge. This also shows the international and empathetic orientation.
Project-oriented learning of the foreign language is achieved through applied linguistics in the classroom. In addition, the modern German-language textbooks for German as a foreign language are designed according to the methodology of project-oriented learning. Accordingly, these teaching materials can be successfully implemented in the curriculum.
Project-oriented learning promotes the possibility of linking different subjects in interdisciplinary collaboration, e.g. culture and technology, climate change and economics. The Georgian Technical University has good facilities and laboratories for project-based learning.

5. Head of the cluster, prof. Mamuka Beriashvili, a young scientist, Dr. Ketevan Rcheulishvili and PhD student Mariam Khazaradze, three-month research visit to Poland. As part of the research visit, a cycle of public lectures was held at the University of Warsaw, at the Institute of Western Relations in Poznan, and at the Academy Ignatianum in Krakow. A scientific conference "Faith and mind in our times" was also held in Warsaw; And the second scientific conference was held in Poznań, at the Institute of Western Relations "Understanding History in Time and Space".

6. Within the framework of the project, several articles were prepared and published, including:
"At the Origins of Georgia's European Orientation" in the collection of scientific works "Studies in Modern and Contemporary History."
"Evolution of European Orientation of Georgia" in the collection of scientific works "Studies in Modern and Contemporary History."

"Intermittent Time: Asian Conquerors and Russian Annexation" in the collection of scientific works "Studies in Modern and Contemporary History."
"Georgia's European Identity Matrix" in the English language international scientific refereed electronic publication "History, Archeology, Ethnology."
Within the framework of the project, business trips were organized to the Georgian Catholic Church in Istanbul and the university archives in Munich.
During a business trip to the Istanbul archive, a special chapter was prepared for the monograph Georgian Sanctuary in Istanbul – A bridge to Europe.
While on a business trip to the Munich University Archives, we found Nikuradze's file from the archive, which, although it was not presented in the monograph due to its specificity, we plan to publish the mentioned material separately, under the auspices of the Rustaveli Foundation. In the paper, we used Nikuradze's photo from the archive.
Within the framework of the project, a presentation was organized at conferences, and articles were published in the collection of conference proceedings, including:
"The European orientation of Georgia" virtual presentation at the 10th International Conference on Humanities, Psychology and Social Sciences in Berlin (10th International Conference on Humanities, Psychology, and Social Sciences).
"Georgia at the origins of the European Orientation" presentation at the international virtual conference in social science. (International Virtual Conference on Social Sciences. In English).
"Genesis of European Orientation of Georgia" presentation at the "Georgia and European Integration" conference in English. The article was published in the conference journal. Presentation of the theme "Projects of the United European Idea and Georgia" at the conference "Georgia and European Integration" in English. The article was published in the conference journal.
The monograph "Genesis of European Orientation of Georgia in Georgian-English language" was prepared and published.
The presented project is interdisciplinary, as it will be possible to use the monograph as an auxiliary manual for humanities and social sciences students.
In addition, the monograph will help Georgian and foreign scholars better understand the European orientation of Georgia, and perceive the European identity of Georgia, which will be a novelty for Georgian and European historiography.
Within the framework of the project, it was revealed that it is necessary to continue research in the direction of Georgian-European values and the Europeanization of Georgia.

7. The project was implemented through the following activities: preparation/printing of the lecture course, conducting lectures for students, holding international scientific conferences, preparation/printing of conference proceedings, and website preparation.

Lecture course

Within the framework of the project, a lecture course on the European idea and European integration of Georgia was prepared for students.

lectures

Three semesters of lecture courses were held during the project. The project beneficiaries were the bachelor students of Engineering Economics, Public Relations, Media Technologies, and a European study.

Since the lecture courses were held online throughout the project, an electronic version of the course was available, which was uploaded to the university's e-learning format. Currently, the course is printed and will be distributed to students next semester.

409 students instead of 360 participated in lectures and seminars. During the project, the number of lecture courses amounted to 390 hours instead of the 360 hours established by the project.

The lecture course has been accredited for 6 years by the Ministry of Education of Georgia, and for at least six years, the lecture course will be available to students.

Conferences

In total, 3 international scientific conferences were held during the project.

The conference was supported by the Faculty of Engineering Economic, Media Technology, and International Relations of Georgian Technical University.

1. Conference Georgia and European integration - July 29-30, 2022

The venue: Tbilisi.The format: hybrid. The language: Georgian-English.

16 educational and scientific institutions in Georgia and abroad participated in the conference. 59 participants attended the conference including: professors, doctoral students, and master's students.

2. Conference Georgia and European integration - September 28-29, 2022

The format: online. The language: Georgian-English.

12 educational and scientific institutions in Georgia and abroad participated in the conference. 41 participants attended the conference including: professors, doctoral students, and master's students.

3. Conference "The Caucasus at the Crossroads: What Role for the EU?" - November 4-5, 2022
The venue: Tbilisi.The format: hybrid. English. The conference was held with the Association of European Studies for the Caucasus (AESC). President Thomas Kressmann.
The conference was opened by the Deputy Rector of Georgian Technical University, Professor Zurab Gasitashvili, and Ms. Evija Kotan, Deputy Head of the Policy, Press, and Information Department of the EU Representation in Georgia;
7 Georgian and 13 foreign educational and scientific institutions participated in the conference. The conference was attended by 34 participants, including professors and doctoral students.

Proceedings of the conference
3 issues of the collection of conference proceedings were prepared and printed. The name of the collection is Georgia and Europe. The scientific articles presented at the conference, which met the required parameters, were placed in the collection.
1. Georgia and Europe of the collection of conference proceedings # 1. The language of the articles is Georgian-English. The number of articles is 18. Page 143.
2. Georgia and Europe of the collection of conference proceedings # 2. The language of the articles is Georgian-English. The number of articles is 15. Page 126.
3. Georgia and Europe of the collection of conference proceedings # 3. The language of the articles is English. The number of articles is 15. Page 94. The collection includes both full texts and extended abstracts.
The articles that are planned to be printed in impact factor journals could not be included in the third issue.

Website
In order to disseminate information about the progress of the project, a web page was created in Georgian and English languages. The website contains all information about the project.

8. During the summer school, professors from abroad were invited: Berkeley University professor - Niklaus Largier, Berlin Humboldt Professor Emeritus Andreas Arndt. Within the framework of the summer school, master's and doctoral students from STU, Zugdidi Shota Meskhi State University and Akaki Tsereteli State University participated. During the summer school, the main research topic was the forms of state organization, the problems and challenges of the constitutional and legal state and their role in terms of the protection and guarantee of human

rights and the exercise of freedom in general. The program was interdisciplinary and included research issues from political science, philosophy, sociology and jurisprudence.

9. Funding organization: Estonian Ministry of Education and Research and "Archimede" Foundation, Estonia

The research project was to focused on the following research questions:
 What is the business environment for enhancing women's entrepreneurial capabilities in Georgia and Estonia?
 What is the extent of access to financial resources for women in Georgia and Estonia?
Given the above mentioned research questions, the research project was focused on exploring entrepreneurial attitude pillars (Opportunity Perception, Start-Up Skills, Risk Acceptance, Networking
Cultural Support), entrepreneurial ability pillars (Opportunity Start-Up, Technology Absorption, Human Capital, Competition) and entrepreneurial aspiration pillars (Product Innovation, Process Innovation, High Growth, Internationalization, Risk Capital).

It is vital to facilitate entrepreneurial activities of high-potential female entrepreneurs who are capable of not only increasing their own economic welfare, but also improving the job creation processes
and cross-border trade thereby considerably contributing to the economic development of their countries.
The research project resulted in recommendations for policy makers, government officials and other decision makers in Georgia who are interested in improving the conditions for the development of high potential women's entrepreneurship.

10. Foreign and Georgian professors and Georgian students participated in the colloquium - "Human rights as a task and challenge for a democratic society". Within the framework of the colloquium, students presented their research papers on the issue of human rights and democracy; - In particular, on the topic of the importance of human rights in a democratic state; why democracy as a form of political organization is the only one suitable for the exercise of liberty; And which forms of democracy can be identified in the context of the idea of freedom.

11. The firm's managers and workers need deep and thorough economic knowledge for successful operation. Obviously, the competitive struggle will be successful only for those companies, whose workers could more reasonably determine market needs and create a truly useful

product, which were able more effectively organize the process of production, provide such services, which were really demanding, provide high profits of the enterprwase and higher income for workers.

These goals can be achieved only as a result of study the Basics of „Economics of the Firm " . The goal of creation of the textbook was to asswast the enterprwases, firms, and organizations in thwas direction. There wasn't a new and complex textbook publwashed in Georgia in recent years, which would be considered not only narrow industrial operating wassues, but the focus would be made on the basic principles, rules and on the progressive methods organizing of the economic activities as well.

The textbook „ Economics of the Firm" has a completely new structure to review the current directions of the firm's activities, including the following chapters: firm logwastics systems, the firm's development methods and sources, ecological factor in the firm's activities, the firm's restructuring processes, analytical activity of the firm, prevention activity of bankruptcy of the firm.

The The textbook will help people overcome the economic and strategic challenges that will arwase not only for the economwasts but also for managers, engineers and other specialwasts. The textbook conswasts of 15 chapters, where were dwascussed in the main wassues of the course of „Economics of the Firm " by logical sequence way.

The textbook will be intended for students who study the following programs: "Economics", "Economic Security", "Management", "Management", "State and Municipal Management". The textbook may be sold and used for providing libraries in order to effectively carry out the study process at various higher education institutions.
As a result of the research, the electronic version of the textbook „Economics of the Firm " was created and therefore the curriculum was enriched and improved.

12. "The State, Politics, Religion" - project was implemented on an interdisciplinary basis, which means that the research questions were presented at the intersection of political science, religious studies, jurisprudence, philosophy and sociology. During the winter school, foreign professors were invited and held public lectures in cooperation with Georgian scientists; Students from Georgian Technical University, Akaki Tsereteli State University and Shota Meskhia State University of Zugdidi participated. Within the framework of the project, the main research questions were what role religion can play in a socially modern democratic state; How should the state manage to ensure equal rights and

freedoms to different religious groups; What is the role of constitutionalism in this point of view; What forms of constitution can be distinguished according to the forms of secularization.

13 In October 2018, the village of Tetritskaro municipality. On the territory of Amlev's cottages, a rescue archaeological expedition was carried out. The author of the mentioned project is: archaeologist, doctor of history, professor Merab Dzneladze. In expedition also participated Archaeologist, Doctor of Historical Sciences, Professor Vazha Sadradze and 10 students of the Department of Archeology and Georgia of GTU.

14. From August 25 to September 9, 2022, village of Ozurgeti municipality. An archeological expedition was underway in Vashnar of the Middle Ages - "Sponieti" located in Gurianta, in the Khertvis of Natanebi and Skurdumi rivers. The author of the mentioned project is: archaeologist, doctor of historical sciences, professor Vazha Sadradze. Archaeologist, doctor of history, In expedition also participated professor Merab Dzneladze and 5 students of the Department of Archeology and Georgia of GTU also participated.

15. The work explains the importance of “soft power” in international relations. Focus is made on ‘international cyberterrorism and strategy of ensuring national security”. ensuring
The major part of the work is dedicated to scientific research envisaged by the project: “ The world education space and Georgia” , “ Global political transformation in West and Georgia” and migration process and Georgia”.

16. Researcher's interests were related to women's entrepreneurship capabilities, in particular, research was aimed at elaborating comparative analyzes on this topic and the targeted countries in this regard were Georgia and Latvia. Researcher's intention was to make recommendations for policy makers, governmental officials, and other decision makers in Georgia who were interested in improving the conditions for high potential female entrepreneurship development.

Researcher's interests were motivated by the fact that women entrepreneurs play an important role in growing their economies. Researcher found that it is vital to facilitate entrepreneurial activities of high-potential female entrepreneurs who were capable of not only increasing their own economic welfare, but also improving the job creation processes and cross-border trade thereby contributing considerably to the economic development of their countries. .

The duration of the research project was 5 months. The research was done on a cross-country basis. In particular, the experience of Latvia was analyzed and the gender-differentiated conditions in Latvia and Georgia were compared.

The study found that this combination of gender attitudes, social norms and beliefs can lead to more limited access to resources such as education, skills and finance that are important to developing the 'high potential' of women's entrepreneurship.

Attitudes also play a critical role in shaping a country's "entrepreneurial culture," meaning how the general population views entrepreneurial endeavors, tolerates risk, and values business ownership as a viable career option. This cultural environment influences the recognition of individual capabilities and the willingness to take risks to start a new venture.

17. XXI century has brought further transformation and changes in production, distribution, consumption, communication, education, employment… A powerful „digital wave“ will surely modify the global economic system.

A so-called „Digital Dictatorship“ is being established, and it is going to radically alter the thought processes, consumer behaviour, and economic activity of the humankind. New hybrid reality with its own, different rules is poised to govern human relationships.

A new reality is characterized by the environment in which the product becomes more knowledge-centric, life cycle is shortened, competition is increasingly fiercer and the rate at which knowledge is used is accelerated. Electronic communication is constantly developing. The world witnesses the establishment of a new class – netocrats, with their immaterial/non-material assets. They are interested in the speed and the volume of the information that can be transferred. They control the —global information mines, and the increasing „raw“ information is the product from these mines.

Among other developments is the formation of a relatively lower class – consumerate. Universal medialization is evident. Digital Economy, as the higher step in the development of traditional economies, is the economy that heavily relies on using digital technology. The basis for digital

economy is the technology for generating data, processing data, storing and transferring data digitally. Data is in fact the most basic and the most important/essential raw ma-terial. Civilization is information.

The development of digital economy is in correlation with the development of the material economy: wherever the latter is adv anced, it becomes easier and it is more effective to develop the digital segments. It would be inaccurate to say that the development of digital economy will result in the decrease of the material/traditional economy.

Digital economy is solving two main problems: 1) it stores and creates data about every possible resource in the unified info rmational register, enriching it with increasingly more data over time; 2) is implement-ing/developing technology to better use these resources.

Digital technological evolution has gone through three stages and is on the brink of the fourth on, which will surely become more evident in 2020, with the onset of the cyber-physical world. The difference between machines and humans will gradually diminish. More generally, digital technologies speed up trade transactions, im-prove transparency and accountability, reduce costs and corruption risks. However, its influence is not unequivocal in all spheres: it is more active and noticeable in media, trading, and banking.

If the disproportionate development among countries was largely predetermined by the natural resources they possessed, their geopolitical situation, and the population of the country, in the age of digitalization, these factors become of secondary concern. Digital economy is governed by two forces that drive it: a) digital data – machine-driven digital data in high volumes, unlimited —raw material‖ and b) digital platform – electronic framework as the new marketplace for trade and transactions.

This model implies the system of education which 1) tries to deal with the systemic challenges from the future perspective; 2) in which students working together on a specific problem will be able to arrive at several solutions; 3) one in which people will feel the connection with problems and not simply prepare for the profession, which is gradually disappearing. To achieve this, it is important to promote and support teachers who can move from the front of the group to the center of the group. Such teacher should be well-educated in one's subject, should possess in-formational-communicational technologies and should always be working on self-development. Education system should be directed towards both the labor market and increasingly on its transformation and development, which are inevitably connected to technological development.

The civilized world has shifted to creative and cognitive development. Countries that will manage to bolster the labor market with cognitive potential will inevitably end up having greater chances for success. Many of the specializations that exist today will no longer be relevant because the employment structure will change. The sphere with the highest earning potential and employment prospects will be nanotechnology. As a result, totally new specializations will emerge in the intellectual sector. To ensure successful employment, skills which robots and machines are incapable to this day of performing are needed (e.g. creative fantasy, improvisation, etc.)

In the civil world, cognitive technologies and the neuronet are being developed. A new interface of the ―brain-computer‖ is being worked on; however, much remains unclear in this last pursuit. Research to boost physical and cognitive capabilities of humans is active-ly conducted. In the new architecture of education, artificial intelligence has gained an important role. Gamification of education is on its way up and learning (teaching) through games is becoming a major educational format. A new scientific model with the scientific and research component in teaching and learning has an increasing share in education. STEM/STEAM/STREAM concepts are being developed and refined. Work is becoming increasingly more multidisciplinary. Autonomous cyberphysics systems, driverless vehicles, hybrid reality, ecological production, personal and customized services, etc. are becoming major fields of employment. In the new and more complex world, routine operations on the assembly line are being phased out; vertical hierarchy in management is weakened; there is a blurring of lines between work time and personal time. Labor market is being altered as well. Modern specialist will face the demand for more cognitive capabilities, and these capabilities will be condi-tioned by artificial intelligence. Employed specialist will integrate in the in-tellectual space entirely. A new type of ―network workers of the creative class‖ is being formed. Thinking style, methods of work, the nature, character and essence of economic relations are being transformed. ―Gig economy‖ is developed, in which a specialist's work resembles a project and the paycheck frequently entirely depends on the ultimate out-come or the product/service that the specialist creates. A new model ―on-demand economy‖ is becoming the new way of running businesses. These processes have social repercussions, and a new social class called precariat is being formed. Work acquires new features – creative functions are strengthened, and specialists with initiative and creative capabilities have a greater role in businesses and the economy. Co-bot practice is on its way to development. Humans will move away from the assembly line and will start performing more difficult and more creative tasks.

18. The project aimed at reading, translating in Georgian, critically learning, analyzing, and commenting of the unknown for the Georgian humanitarian science till today – handwritten materials (433 pages) available in Italian and Latin, as well as their publishing entitled "European Sources about Georgia". The sources were discovered in the archives of Vatican and contain information on various topics of the Georgian history from the 70-s of the XVII - throughout the XVIII century. Within the framework of the project, based on the translated materials and the newest foreign special literature, which traditionally has been poorly familiar for the Georgian historiography, there has been issued the fundamental work in Georgian and English, entitled "Georgia in the European World (the 70-s of the XVII Century - XVIII Century)". Development of search towards this direction represents one of the most perspective scientific tasks nowadays.

19. Orientation of Georgia towards Europe, the idea of Europeanness has deep historical roots. Georgia's European orientation, striving towards Europe was visible at every historical stage and the European idea was manifested in different forms, be it cultural, religious, military, diplomatic, political or economic. In the 13th - 18th centuries, mutual cooperation between Georgia and Europe moved to a new stage, which mainly included the sphere of religious and diplomatic relations. The implementation of the European idea for Georgia in this era was mainly discussed through the Holy See, and in this regard the Georgian authorities relied on real foundations. At the time of feudal domination, the Catholic Church and the Holy See represented the symbol of European unity and the sole executor of the European Christian idea. That is why in the 13th - 18th centuries, for studying the genesis of the European idea of Georgia, it is important to study the relations between Georgia and the Holy See of this era.
The main goal of this project was to translate, analyze and publish previously unknown or partially published documents brought from the Vatican archives as new documentary material for the history of medieval Georgia.

20. The credit, insurance and lease relations, the growing prominence of the real estate market and investment environment caused by activation of the demand for real estate assessment. Knowledge of value evaluation became an inseparable instrument for modern businessman, financier or manager.

The purpose of the textbook „Valuation of real estate" was to create a comprehensive research on the subject, such as: real estate; its assessment methods and approaches; assessment of land plot and mortgage-investment equipment, standards of real estate assessment; basic approaches to real estate assessment; market (comparative) approach in real estate assessment, expenditure approach in real estate assessment, etc.

The textbook „Valuation of real estate“ focuses on the theoretical aspects of real estate valuation, the methodology wassues, on the nuances of real estate objects evaluation and approaches in practice.

The textbook was intended for professors, students and masters, as well as professionals and managers of the firm who carry out their activities on the real estate market, including assessors.

21. Both theoretically and practically, the research of the innovative sector of the economy is a priority in the modern world. Moreover, the innovative development of countries is recognized as a non-alternative factor of global economic progress.
The world is progressing at a rapid pace, as evidenced by the rapid "moral depreciation" of scientific and technical achievements. Developing countries are making significant strides in shaping and modernizing national innovation systems. They develop state innovation policies, create appropriate legal bases and innovative infrastructure, strengthen the propaganda of small innovative entrepreneurship and science-based production, colossally increase investments in scientific research and development and etc.
The book focuses on the developmental stages of society, the theoretical aspects of innovative development, the concept of innovation, the essence and prehistory. As well as the relationship between innovation features, costs, and likelihood of outcomes.
Besides, it analyzes the role and importance of innovation policy in modern conditions, world-proven national innovation systems and strategic models, features of eco-innovation, intellectual capital and innovative infrastructure, etc.
The book is intended for readers interested in these issues, as well as for students majoring in economics and business, and can be used as a basic or auxiliary textbook in higher education.

Grants of Shota Rustaveli National Scientific Fund

attachment1

№	Title	Supervisor	Start and end completion dates	Amount	Status Completed/ongoing	Code
1	Georgia in the European World (The 70-s of the XVII Century - XVIII Century)"	Zurab Gamezardashvili	2017-2021	208000.00 Gel	Completed	[grant HE17_21]

2	The genesis of Georgia's European orientation	Emzar Pazhava	2018-2022	57 000 GEL	Completed	Grant agreement YS-18-200

-**Aim of the project**-
Introducing into the scientific circulation of the unknown until nowadays - historical sources about Georgia of the XVII -XVIII centuries preserved in the archives of Vatican.
-**Outcomes**-
"European Sources about Georgia" (based on the handwritten materials available in Italian and Latin); Monograph: "Georgia in the European World (the 70-s of the XVII Century - XVIII Century)" (in Georgian and English).
-**Recommendations:** target audience: Researchers, MA, Ph.D. students

Abstracts:

2. - specific result:

Lecture course
Within the framework of the project, a lecture course on the European idea and European integration of Georgia was prepared a nd published for students.

Lectures

Three semesters of lecture courses were held during the project. The project beneficiaries were the bachelor students of Engineering Economics, Public Relations, Media Technologies, and a European study.

409 students instead of 360 participated in lectures and seminars.

International scientific Conferences

In total, 3 international scientific conferences were held during the project.

Proceedings of the conference

3 issues of the collection of conference proceedings were prepared and printed, including in English.

The name of the collection is Georgia and Europe.

17 Georgian and 13 foreign educational and scientific institutions participated in the conference. The conference was attended by 134 participants, including professors and doctoral students.

Website

In order to disseminate information about the progress of the project, a web page was created in Georgian and English languages. The website contains all information about the project.

Recommendations: target audience - undergraduate students of engineering economics, public relations and media technologies. Scientists, undergraduates, and doctoral students.

Faculty of Engineering Economics, Media technologies and Social Sciences

International Grants

Attachment 2

№	Institution issuing grant	Title	Start and completion date of the project	Supervisor	Amount	Status Completed/ongoing	Code
1	Estonian Ministry of Education and Research and the Archimedes Foundation (SEDA)	Issues of promoting the development of women's economic opportunities in Georgia	16.04.2020 - 03.05.2020	Prof. Dali Sekhniashvili	720 euros	Completed	
2	Latvian State Science Grant Education and Development	Empowering women entrepreneurship in Georgia	02.02.2019 03.07.2019	Prof. Dali Sekhniashvili	6000 euros	Completed	

	Agency (SEDA)						
3	Erasmus+ Jean Monnet Module	European Idea and Georgia's European Integration	2018-2022	Emzar Pazhava	30000 EUR	Completed	Grant agreement # - 2019 - 1899 / 006 – 001)

Project: „**Issues of promoting the development of women's economic opportunities in Georgia**“

Abstract: The research project was focused on the following research questions:

- What is the business environment for increasing women's entrepreneurial abilities in Georgia and Estonia?
- What is the availability of financial resources for women in Georgia and Estonia?

Specific result - As a result of the research, the areas that need improvement and the factors that will support the activities of high-potential female entrepreneurs in Georgia were identified.

Recommendations. Following the completion of the research project, a number of recommendations were formulated for policy makers, government officials and other decision makers in Georgia who are interested in improving the conditions for the development of high potential women's entrepreneurship in Georgia. Recommendations were published in the form of articles in internationally refereed and peer-reviewed scientific journals: "Business Engineering" and "Economics and Finances".

Project: **"Strengthening women's entrepreneurial opportunities in Georgia"**

Abstract: The aim of the project was to study the most effective initiatives in Latvian women's entrepreneurship and to share their experience in this field.

Specific result - A comparative analysis was made about existing practices in fild of strengthening women's entrepreneurial abilities in Georgia and Latvia. Taking into account that Latvia has high positions according to international indices in this field there was analyzed the Latvia's experience and were compared the conditions of gender differentiation in Latvia and Georgia.

Recommendations – The recommendations on the basis of comparative analysis were published in the articles in internationally refereed and peer-reviewed scientific journals: "Business-Engineering" and "Economics and Finances". Scientific research was presented at the International Scientific Conference "Paradigms of Institutional, Economic and Cultural Development" July 26, 2019, Riga, Latvia. Topic of the report: Socio-economic significance of women's entrepreneurial activity and new initiatives for women's economic empowerment. The presentation was published in the conference proceedings.

Abstracts:

1. - specific result:

Lecture course

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lectures

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Website

In order to disseminate information about the progress of the project, a web page was created in Georgian and English languages. The website contains all information about the project.

Recommendations: target audience - undergraduate students of engineering economics, public relations and media technologies. Scientists, undergraduates, and doctoral students.

Faculty of Chemical Technology and Metallurgy

Scientific projects

Department: Environmental Engineering and Ecology

Appendix 3

Completed projects

№	The name of the completed project, indicating the field of science and scientific direction	year	Head of the project	Project manager Lebi
1.	Study of the impact of pathogenic bacteria on the ecological condition of Paliastom Lake, modeling and preventive measures to prevent it	2015-2019	Prof. Leila Gvedtsiteli Prof. Dimitri Eristavi	Grigol Abramia
2.	St. Modeling of the spread of aerosols emitted from the Zestafon ferroalloy plant and its ecological assessment	2016-2019	Prof. Leila Gverdsiteli Alexander Surmava, Phys-Mat. Doctor of Science	Natia Gigauri
3.				

4.	Assessment of the ecological condition of the use of underground waters of the Khram River basin as a drinking-agricultural water supply system	2017-2020	Prof. Leila Gverdsiteli Alexander Surmava, Phys-Mat. Doctor of Science	Tamar Nikuradze
5.	Assessment of the ecological condition of the Kvirila River basin and numerical modeling of the distribution of polluting substances	2018-2021	Prof. Leila Gverdsiteli Alexander Surmava, Phys-Mat. Doctor of Science	Maya Ochigawa
	Assessment of environmental impact of production of meat products of "Mithana" LLC	2017-2018	Prof. Leila Gverdsiteli	Nino Papuashvili
6.	Assessment of the impact of uncontrolled landfills on the ecosystems of some regions of Georgia using mathematical modeling	2019-2022	Professor, Dimitri Eristavi, Acad. Doctor, Nugzar Buachidze	Ekaterine Shubladze
7.	Assessment of the ecological condition of the main transboundary rivers of	2020-2022	Professor, Dimitri Eristavi,	Tekla Khumarashvili

	Georgia and their classification through some hydrochemical indicators.		Acad. Doctor, Nugzar Buachidze	
8.	St. Ecological expertise of the Batumi Sapfueri workshop	2021-2022	Isolda Bazgadze -	Tea Khmiadashvili
9.	Assessment of the ecological condition of the impact of anthropogenic factors on the small rivers of the Mtkvari river basin within the city of Tbilisi and the development of mitigation measures	2019-2022	Jimsher Kerkadze, Levan Tsulukidze	Irakli Rostomashvili
10.	Ecological aspects of the production of scrap and waste recycling of accumulators	2021-2022	Giorgi Mchedlishvili; Maya Gugeshidze	Khatuna Shermadin
11.	Physical properties, chemical composition of liquid and solid phase of Dmanisi deposit and its medicinal use	2021-2022	Shalva Andghuladze	Omiadze Khatuna
12.	Cleaning of waste water of mining enterprises from heavy metals	2021-2022	Shalva Andghuladze	Ekaterine Mumladze
13.	Environmental Impact Assessment of Protective Coatings - Zinc Coatings Enterprise	2020-2022	Prof. Leila Gverdsiteli	Keti Tsukhishvili-

14.	Assessment of the ecological condition of the Kvirila River basin and numerical modeling of the distribution of polluting substances.	2018-2023	Prof. Leila Gverdsiteli Alexander Surmava, Phys-Mat. Doctor of Science	Maya Ochigawa
15.	Waters of the Iori River basin as a drinking and agricultural water supply system	2020-2023	Prof. Leila Gverdsiteli Alexander Surmava, Phys-Mat. Doctor of Science	Nino Shustakashvili
16.	Reclamation of biogenic elements with natural sorbents for soil reclamation of uncontrolled landfills	2022-2024	Professor, Dimitri Eristavi, Acad. Doctor, Nugzar Buachidze	Salome Tabatadze
17.	Physical-chemical and microbiological studies of solutions, liquid and solid phases of polymer compositions	2021-2026	Manana Mamulashvili	Manana Mamulashvili
18.	Environmental impact assessment of Metekhi ceramic brick production	2021-2023	Prof. Leila Gverdsiteli	Nino Shustakashvili
19.	Identification of polluting sources in the working zone of the city of Rustavi	2020-2024		

	and development of preventive measures to reduce them		Prof. Leila Gverdsiteli	Noe Megrelishvili
20.	Numerical modeling of the distribution of polluting substances in the Kvirila river basin and development of preventive measures	2019-2024	Prof. Leila Gverdsiteli	Maya Ochigawa
21.	Phytomigration of residual heavy metals after chemical treatment of technogenically polluted acid quarry waters	2019-2024	Professor, Giorgi Mchedlishvili, Guranda Avkofashvili	Konstantine Khachapuridze
22.	The possibility of efficient use of material and energy resources in a manganese-free raw material and waste processing enterprise	2021-2023	Assoc. Professor Jimsher Kerkadze	Rati Jashiashvili

An extensive annotation on the main theoretical and practical results of the research project in 2022

1. In the direction of the scientific-research work "Study, modeling and preventive measures of the impact of pathogenic bacteria on the ecological condition of Lake Paliatomi" in the stage of 2018: chemical and microbiological analysis of the water of Lake Paliatomi was carried out. Also chemical analysis of bottom sediments. As a result of the studies, it was established that Palistome water belongs to the sodium-chloride type of water. According to mineralization, it is brackish water. Also, the hardness varies from moderate to very hard water depending on the water samples, which is indicated by the calcium and magnesium content. The concentration of biogenic

substances is less than the maximum allowable concentrations. Among the heavy metals, iron was recorded in a relatively high concentration. As a result of the chemical analysis of bottom sediments, it was determined that the composition of heavy metals is moderately within acceptable norms and can be considered background. Based on the microbiological analysis, the number of total coliforms exceeds the level of acceptable norms, and E-coli type bacteria were observed in two water samples. Numerical modeling of the spread of microorganisms is currently underway.

2. Scientific-research work " St. Modeling of the spread of aerosols emitted from the Zestafon ferroalloy plant and its ecological assessment" was completed in 2018: the sources of air pollutant aerosol formation in the city of Zestafon and its components, whose concentrations are determined according to wind directions, were discussed. A diagram of the change in their minimum, average and maximum concentration is constructed, according to which the maximum concentration of dust is maximum in November-December 2017 and decreases in the first half of 2018. The value of the maximum concentration of manganese dioxide increases in the first half of 2018, the maximum concentrations of sulfur dioxide and carbon dioxide change insignificantly, and the maximum concentration of nitrogen dioxide is the maximum value in the month of November 2017, while it decreases in the first half of 2018. The distribution of city dust in the air of the city of Zestafoni in the direction of weak, medium and strong background westerly wind is studied. The regional model of the development of atmospheric processes in the Caucasus and the non-stationary three-dimensional equation of the transfer-diffusion of passive impurities are used in the modeling. It is also numerically modeled and studied. Dust distribution in Zestafon in case of prevailing background easterly and westerly winds typical for this area. The images of the spatial distribution of dust were obtained, the influence of orography, horizontal, vertical turbulence and advection processes on dust dispersion in the atmosphere was analyzed. The common and distinctive features that characterize the dust distribution during the background easterly and westerly winds are investigated. Numerical modeling determined the features of dust deposition on the soil of the city of Zestafoni, their distribution area and quantity in the case of prevailing winds. It has been shown that dust is deposited on the soil in the form of a narrow band, the shape of which depends on the background wind speed, relief orography, advective and turbulent processes. The obtained results are in qualitative agreement with the general kinematic regularities of substance diffusion in a continuous medium and natural measurement data.

3. The scientific literature was discussed and studied. The physical-geographical location of Khrami River, Debeda River and Mashavera River itself was studied on the spot. Also, the underground water supply wells of Khram River and Debeda River for the drinking-agricultural water supply system were inspected and studied. Water sampling points of Khram River, Debeda River and Masavera River were selected. Water samples were taken for chemical and microbiological analysis and for chemical analysis of bottom sediments. Sampling, preservation,

storage and transportation were carried out according to international ISO standards. Currently, laboratory research works on samples of collected water and bottom sediments are being carried out.

As a result of the ecochemical and microbiological research of the water of the mine wells of the Khram river basin, it was determined that the water belongs to the hydrocarbonate-sulfate calcium type of water. The concentration of biogenic substances and heavy metals is much lower than ZDK, and microbiological pollution is not observed.

4. In order to complete the work, the goal is set, literary sources are processed, the physical and geographical features of the Kvrila River are studied.

location, the main sources of pollution are determined.

Water resources are of great importance in providing favorable conditions for the population, economy, normal functioning, environment preservation. Providing the population with water was and is the priority task of our country for the normal functioning of the country. As in other countries, there is also an increase in water pollution in Georgia. The reason for this is the pollution of water bodies with insufficiently purified water and industrial waste, the reduction of natural water catchment areas, the destruction of forest massifs, the production of agricultural activities with incorrect methods. Solving the problem of the purity of natural waters is primarily related to the increase in the volume of wastewater.

Kvrila River flows in Western Georgia, in Sachkheri, Zestafoni, Terjoli districts and in the territory of Chiaturi City Council. It is the left tributary of Rion. The water of Kvirila River is used for irrigation and for the enrichment of manganese ore by gravity method. Kvirila water village. It is black below the belt and clear above it. village The ore extracted in the manganese mines of Darakheti is first processed in the factory located on the Chruchula river, mechanically processing is carried out using an old-fashioned method. The river Kvirila is being polluted by the waste and wastewater of the "Chiathurmanganum" and Zestafoni ferroalloys factory. The Chruchula river is also polluted by the silicate factory, which is why it takes on a white color. The intensity of the harmful effects of enterprises is high, which is mainly related to the imperfection of the technological regime and the operation of existing facilities.

The health of society depends on the use of clean water available to the population. Therefore, the river Assessment of the ecochemical condition of the Kvirila basin is relevant.

Up to 260 million tons of raw ore have been mined in Chiatura, and up to 130 million tons of goods have been sold. Production union "Chiathurmanganum" by Md. 13.5 million cubic meters of water was released into the geyser, which was contaminated with various substances, including 1,449 tons of particulate matter and 37.2 tons of manganese. River in the village of Darkets. Black and white tributaries polluted with industrial wastes join the scream, as a result of which the river Screaming water turns black. Due to this, the physico-chemical properties of water change, which affects the quality of river water purity, flora and fauna, as well as the health of the population, the water of the Kvrila river is unusable, both for drinking and for the technical water supply system.

Therefore, the main task of the doctoral thesis is the river. Carrying out ecological monitoring to determine the values of the main pollutant components of Kvirila basin. The main document of the state policy in the field of protection and use of water resources of Georgia is the Law of Georgia "On Water". The rivers of Western Georgia flow into the Black Sea and thus affect the pollution of coastal waters. Modern management of water resources is based on an integrated approach. Therefore, the novelty of the dissertation is the numerical modeling of the distribution of pollutant concentration values in the water and bottom sediments of the Kvirila River.

5. The scientific literature was discussed and studied. The technological process and equipment for the production of sausages in the enterprise itself were studied. Sources and substances polluting environmental objects (atmospheric air and water) were determined. A priority air pollutant is the smoking chamber of meat products, from which an aerosol is released, which is smoke and consists of beech sawdust, carbon oxide and organic substances. From the technological process of meat products production to the raw material processing area. Also, as a result of washing the equipment and the inner territory of the workshop, water contaminated with fats, raw materials and product residues is produced.

Calculations of the marginally permissible dispersion of atmospheric air pollutants and the maximum land-side concentrations according to the sanitary-protective zone, as well as the determination of the marginally permissible discharge of waste water according to the existing methods, were also investigated.

6. The aim of the paper is to determine the influence of uncontrolled landfills on the processes of ecosystem pollution and, accordingly, to assess their impact on the health of the local population.

On the territory of Georgia, there are many uncontrolled landfills with small areas. They can often be found in regions close to populated areas, in ravines or on the banks of rivers, which creates a danger of deterioration of the ecological situation in relation to the surrounding areas. In addition, there is no state hazardous waste landfill in Georgia, and therefore there is a high probability that this type of waste ends up in uncontrolled landfills, which is why uncontrolled landfills remain quite dangerous objects for the population living there.

Currently, there are about 50 official landfills and numerous small (each area <0.01 ha) illegal landfills registered in Georgia. Waste collection and removal services are not fully implemented in the regions of Georgia, many villages are not provided with a specific service, due to which the population is forced to place the waste in the areas chosen by them arbitrarily. In many cases, it is not possible to remove or clean them from the given areas and, therefore, they remain there for many years and become one of the sources of pollution of the surrounding areas with different types of waste. Therefore, the sanitary condition of these areas is significantly deteriorating.

In this study, field expedition work was planned, which involves taking analytical samples from the research objects, determining the physico-chemical indicators (pH, temperature, oxygen dissolved in water, electrical conductivity, salinity) on the spot and transporting them to the laboratory for

chemical and microbiological analysis, such as the natural forms of biogenic elements. (NO_2^-, NO_3^-, NH_4^+, PO_4^{3-}) determination by ion-chromatographic method, determination of heavy metals by plasma-emission spectrometer-ICP-OES, determination of some main ions by spectrophotometric method and microbiological analyzes (E-coli, total coliforms and faecal streptococci) by membrane filtration method.

The ecological condition of some regions of Georgia (Kakheti, Imereti, Samtskhe-Javakheti, Shida and Kvemo Kartli, Mtskheta-Mtianeti, Tbilisi) surrounding the uncontrolled landfills was studied according to the main polluting chemical and microbiological components; Remediation of landfills using Georgian sorbent (clinoptilolite); Based on the numerical modeling of heavy metal concentration distribution, the work presented shows the opening of the environmental pollutant lead sulfate ($PbSO_4$) that got into the landfill and its infiltration in the 4-m layer of the sample.

The results of the conducted research are:

inventory of uncontrolled landfills in some regions of the territory of Georgia;

Selection of pollutant components typical for uncontrolled landfills;

conducting chemical and microbiological studies of surface waters near uncontrolled landfills;

Survey of the soils of the areas adjacent to the uncontrolled landfills in terms of contamination with heavy metals;

During the study of soil contamination with heavy metals, it was determined that uncontrolled landfills pollute the surrounding areas with dangerous elements such as lead, zinc and copper, the concentrations of which exceed their respective not only marginal or guideline concentrations, but even background values.

Microbiological analyzes of surface waters in the vicinity of uncontrolled landfills have shown that in many cases uncontrolled landfills create an unsanitary situation in the surrounding areas.

Remediation of uncontrolled landfills was carried out using Georgian sorbent (clinoptilolite).

Based on the numerical modeling of heavy metal concentration distribution, it is shown the opening of the polluting substance-lead sulfate ($PbSO_4$) that got into the landfill and its infiltration in the 4 m layer of the sample.

Based on all of the above, it becomes clear how urgent a problem it is for Georgia to identify uncontrolled landfills - inventory and assess their role in environmental pollution processes based on the reality of our country.

7. In the research project: "Assessment of the ecological state of the main transboundary rivers of Georgia and their classification through some hydrochemical indicators" it is determined based on the ecochemical analysis of the tributaries of the transboundary Mtkvari River - the Vere, Dighmula and Gldanula rivers - the requirements of the European Directive - "European Union Water Framework Directive (2000/60/EC)" classification of water quality with the help of hydrochemical indicators.

The article discusses St. Hydrochemical and physico-chemical indicators of rivers - Vere, Dighmula, Gldanula within Tbilisi (2019-2021); Among them, the most characteristic polluting biogenic components for these rivers, which cause pollution of the transboundary river Mtkvari, were selected.

At the next stage of the work, the values of the hydrochemical indicator selected by us were averaged (three years' data), the obtained values were entered into the equation proposed by us, as a result of which we obtained the values of the water pollution index of the self-contained river, and subsequently, taking into account the obtained values, the water quality classification of these rivers was evaluated and assigned (according to the guidelines of the Eurodirective).
According to the averaged data of 2019-2021 and taking into account the pollution indices obtained accordingly, the rivers - Vere, Dighmula and Gldanula - were assigned certain classifications of water quality in this given period, in particular, the Vere river belonged to the class of slightly polluted river, while the rivers Dighmula and Gldanula were classified as clean river water (although Their pollution indices are close to the class of the second class, i.e. slightly polluted river).
The presented work is also relevant in that in the future, in the event of the accumulation of certain statistical data, it will be possible to re-evaluate according to the given methodology, which will allow us and also clearly show us how much the quality of the given rivers changes, or changes for the better or vice versa.

8. The work of literature review has been performed, which takes into account the selection criteria for the location of the production facility, the analysis of the current state of the natural environment of the area surrounding the production facility is reported. Will study the main stages of the technological process of the yeast workshop, the characterization of the initial raw materials and the obtained product. methods of production control and laboratory analysis of products.

Depending on the legislative requirements of Georgia and the technological processes of the planned activity, the types of environmental impact will be discussed: the impact on the atmospheric air, hydrosphere (during the discharge of technological wastewater) and the qualitative state of the soil and the study of their further ecological state.

9. In the presented paper, a complex ecochemical investigation of anthropogenic impact on two micro-basins of the Mtkvari river basin within the administrative framework of the city of Tbilisi, on the side of the industrial zone and civilian settlements adjacent to the valleys and beds of the rivers - Lochin and Orkhevi, and the development of environmental measures to mitigate this negative impact are discussed.

In the literature review part of the work, the accumulation and analysis of hydrographic and ecological information found in the scientific literature and found on Internet resources about 15 microstructures of the Mtkvari River. As a result, two rivers - Lochin and Orkhevi - were selected as research objects. The choice was mainly due to two arguments. One is that, unlike others, the valleys and beds of these small rivers are under a rather strong anthropogenic influence, adjacent to each other and surrounded by civil type settlements and industrial facilities. Built with an industrial zone in the surrounding territorial area. Secondly, these river objects are distinguished from other microstructures of the river Mtkvari by the presence of constant flow, which allows for systematic seasonal monitoring of both rivers throughout the calendar year. It was allowed.

The paper clearly outlines the relevance, goals and objectives of the selected topic, and also shows the scientific novelty of the topic. More specifically, the purpose of the research work was to carry out a complex ecochemical study with the aim of studying the anthropogenic impact on two pre-selected observation sites. This is especially true of the Orkhevi river, which until now, in a way, was thought of as a river forgotten by everything. That is why any beneficial scientific activity carried out in relation to it should be perceived as an unconditional innovation not only in the Georgian scientific circle, but also in the civil society.

In order to fulfill the set goals and objectives, about ten field expeditions were conducted in 2021-2022, during which the physical-geographic location of the research area was personally studied, cartographically determined and Monitoring points (intersections) were marked, from which samples of surface water, bottom sediments and soil soil were taken purposefully and with seasonal periodicity. Their collection, preservation, labeling, storage and subsequent transportation to the stationary laboratory were carried out in accordance with ISO standard methods. For the surface waters of the research rivers, the physico-chemical characteristics were measured in field conditions with a portable portable device, and in the laboratory environment, the chemical, physical, and chemical characteristics of the samples were carried out using modern scientific equipment. - Chemical and micro-biological analyses. Hydrochemical research of pH, electrical conductivity, dissolved oxygen, mineralization, basic ions, presence of forms containing biogenic elements, concentration of heavy metals in analytical samples generally determined that Compared to the Lochin River, the Orkhevi River is characterized by much higher levels of pollution in terms of the studied parameters. This is particularly visible when the mineralization, sulfates, LBM5 and ammonium nitrogen contents are systematically recorded in their samples, as well as when the concentration coefficient is normal. In relation to the same indicators. As for the content of heavy metals in the surface waters of both rivers, concentration changes are subject to seasonality, although it is very rare, but still an excess of iron and manganese compared to the normative indicators is noticed. In the same samples of bottom sediments, in relation to other metals, iron content is dominant.

The microbiological research conducted on the surface water samples taken from the research facilities showed that the river was contaminated with coliform bacteria. Data from Lochin River. It is much higher than Orkhevisa. However, on the other hand, the badgers of both rivers, according to the same characteristic, are much higher than the norm. This indicates a potential threat to the waters of both researched rivers, so they can be considered local centers of bacteriological pollution.

Conducting studies with different physico-chemical methods of analysis on bottom sediment samples taken seasonally from both research rivers had different goals from each other. X-ray fluorescence spectral analysis determined the elemental content of the bottom plates, on the basis of which some heavy metals (Fe, Mn, Zn, Cu, Pb) were identified by sorption-sedimentation processes in the bottom. The character of getting into the sediments and seasonally distributing their accumulation there, which was still distinguished by the dominance of iron. In addition to the mineral component, conducting research on bottom sediment samples by infrared spectrometry was dedicated to determining the presence of organic substances in these samples, although for both rivers The organics were recorded only in the form of insignificant traces on the recorded infrared spectra, which confirmed the assumption about the removal of light organic fractions from the bottom by the river water flow. By carrying out X-ray phase analysis, the

composition of the crystalline phases of their substrate was specified in the samples of bottom sediments, which were mainly represented by clay minerals containing aluminosilicates on the diffractograms.
Using the method of correlational statistical analysis, close and high-quality, both positive and negative correlations were revealed in the paper between the concentrations of individual main ions and hydrochemical variable parameters in the surface waters of the research rivers, and in the bottom sediments a number of also between correlated pairs of heavy metals. The anthropogenic pollution of the Orkhevi River was confirmed once again through the dot scatter diagrams constructed according to the correlation matrix table.
In order to assess the degree of pollution of the research rivers and, based on this, to give them the appropriate classification, the average annual pollution indices of their surface waters were calculated using selected hydrochemical indicators. Based on the conducted calculations, the water of the Orkhevi River was conditionally assigned the "slightly polluted" category, and the river The water of Lochin is considered "pure", which according to the quality indicator is very close to "slightly polluted".
In addition, the bed accumulation coefficient, considered as an additional qualitative indicator of pollution, was calculated separately for the research objects, according to which it was determined that none of the research rivers belong to the center of chronic pollution with heavy metals.
Using the mathematical modeling method, the numerical modeling of the kinetic process of the sedimentation of heavy metal - iron, characterized by its dominance in the bottom sediments of the river Orkhev, and the speed of vertical-turbulent diffusion and gravitational sedimentation as the driving force of this process was performed. manifest as forces.
In the literary review part of the paper, the sharing of contemporary advanced European experience in the field of fragmented revitalization of small rivers found a practical reflection in the Aliskhevi river, one of the micro-tributaries of the Lochin River, which with its frequent seasonal water It is known and distinguished for its landslides caused by rainfall. It is for this river and its bed that flood mitigation measure was developed, which was presented by proposing a hydrotechnical flood control structure - a three-level weir and the proper mathematical calculation required for its construction.
The practical importance of the research work is made valuable by the fact that the National Environmental Agency of Georgia has included the Orkhevi River in its multi-year monitoring research program on water resources across Georgia only from 2021, which is directly related to this work. It is closing.

10. Project of a utilization enterprise, which includes the main moments of the technology of recycling of lead accumulators and the assessment of ecological aspects during the operation of the enterprise.

Modern methods of recycling scrap lead accumulators are discussed, the waste generated during the process of disassembly of accumulators is evaluated and means of their disposal or further use are indicated.

In order to minimize the emission of harmful substances into the ambient air, the project envisages the installation of a modern air cleaning system, which ensures their high percentage capture, and the return of lead-containing dust to the production cycle.
The main pollutants are calculated in the paper. Their emissions before cleaning and taking into account the cleaning system. Emissions from the furnace and during the refining process are presented. Also total emissions by ingredients.
In the paper, there is a great place to determine the maximum permissible emission of polluting substances, the maximum value of above-ground concentrations, and the determination of the boundaries of the sanitary protection zone of the enterprise.
Issues of water supply system and wastewater neutralization of the enterprise are discussed. Based on the obtained results, relevant conclusions are presented.

11. All the literature or scientific articles related to the topic of the given work were searched and processed and accordingly they were processed and evaluated for the literature review. Accordingly, the introduction and literary review of the scientific topic was completed and formalized.

Medicinal mud (peloid), with which Georgia is rich, belongs to the precious natural object of the environment, which is widely used in the field of medical, perfumery-cosmetic and resort-sanatorium services.
A complex research scheme was carried out, the use of which will make it possible to study any location and the basis of different types of muds. Which, in turn, will allow us to solve the issues related to the perspective of their use in a new way, on a scientific level.

12. During the discovery and processing of minerals, the generation of pit waters contaminated with heavy metals is one of the factors with a destructive impact on the environment, which occurs in the case of processing of barytopopolymetallic ore rocks of the Madneuli ore deposit. The acid quarry waters formed at this time belong to sulfate class saline waters in their composition, and their discharge and composition vary within wide limits depending on the time of year.

The annual observation of the quality and qualitative composition of the continuously generated quarry flows allows the given waters to be classified as secondary technogenic hydro-mineral resources, the processing (cleaning) of which allows to reduce the irreversible losses of non-ferrous metals, as well as to reduce the pollution of the surrounding environment with both liquid and solid waste.
The purpose of the work is to clean the acid pit waters from heavy metal ions, generated during the processing of copper-containing man-made resources of the Madneuli mining and beneficiation complex, using the sulphide method.
Experiments were conducted on model solutions, where some regularities of the dependence of the properties of copper, iron and zinc cations on the concentration of sulfide ions and the pH of the solution were studied, and at the next stage, the regularity of precipitation of cations in a multi-

component system and the influence of precipitation conditions in real solutions on the rate of phase separation, precipitation moisture and on the size of the volume. Finally, the possibility of implementing the developed technology for cleaning acid quarry waters is evaluated.
Thus, the proposed cleaning technology provides for the use of sodium sulfide (Na2) as a precipitating reagent, which is obtained by processing the stored raw materials - barites - on the territory of the enterprise.
The used precipitating reagent (sodium sulphide), in addition to deep cleaning, allows obtaining heavy metals in the form of sulphides, which are easily split and thus provide an additional sulphide concentrate.
The proposed technology, in addition to the cleaning of acid quarry waters, also provides for the use of stored raw materials, the processing of which is used to obtain a competitive product - Blanfix, which has a wide range of applications. Development of quarry water purification technology using barite ore provides a complex use of the starting material and enables the utilization of waste along with obtaining the target products (blancfix, precipitation reagent, non-ferrous metals), which aims to prevent environmental pollution. The results of the trial works for the recovery of barite concentrate and the use of sulphides as a precipitating reagent for cleaning quarry waters from heavy metals prove the prospect of using the developed technology.

13. It has been studied and researched. Rustavi Sh.P.S. Assessment of the environmental impact of the galvanizing workshop of the protective coverings of the "Lithonconstruction" plant.

Protection of various metals and steel products from corrosion is carried out by protective-decorative galvanizing, copper plating, plating, quenching, and plating, widely used in electroplating. For the electrochemical protection of steel parts in industrial conditions, zinc coatings are preferred.
Based on the legislative requirements of Georgia and the technological processes of the planned activity, the purpose of the research work is to study the technological process of electrolytic smelting, to assess the impact on the quality of atmospheric air, hydrosphere and soil and their ecological condition. The used water, which flows into the sewage network, must meet the discharge norms.
Analysis of the existing state of the natural environment of the area surrounding the production facility, assessment of the impact of the enterprise on environmental objects, socio-economic environment, and human health is very relevant.
According to the results of the environmental impact assessment of the protective coverings of the smiths workshop, atmospheric air and soil pollution is channeled. Depending on the specifics of the technological process of electrolytic sintering, waste water containing various toxic substances is produced. Therefore, in the form of preventive environmental protection measures, we developed two schemes of the technological process of wastewater treatment using chemical and electrochemical methods, which is a novelty of the work.

14. . Water resources are of great importance in providing favorable conditions for the population, economy, normal functioning, and environment preservation. Providing the population with water was and is the priority task of our country for the normal functioning of

the country. As in other countries, there is also an increase in water pollution in Georgia. The reason for this is the pollution of water bodies with insufficiently purified water and industrial waste, the reduction of natural water catchment areas, the destruction of forest massifs, the production of agricultural activities with incorrect methods. Solving the problem of the purity of natural waters is primarily related to the increase in the volume of wastewater.

Kvrila River flows in Western Georgia, in Sachkheri, Zestafoni, Terjoli districts and in the territory of Chiaturi City Council. It is the left tributary of Rion. The water of Kvirila River is used for irrigation and for the enrichment of manganese ore by gravity method.

Up to 260 million tons of raw ore have been mined in Chiatura, and up to 130 million tons of goods have been sold. Production association "Chiathurmanganum" by Md. 13.5 million cubic meters of water was released into the geyser, which was contaminated with various substances, including 1,449 tons of particulate matter and 37.2 tons of manganese. River in the village of Darkets. Black and white tributaries polluted with industrial wastes join the scream, as a result of which the river Screaming water turns black. Due to this, the physico-chemical properties of water change, which affects the quality of river water purity, flora and fauna, as well as the health of the population, the water of the Kvrila river is unusable, both for drinking and for the technical water supply system.

Therefore, the main task of the scientific paper is the river. Carrying out ecological monitoring to determine the values of the main pollutant components of Kvirila basin. The main document of the state policy in the field of protection and use of water resources of Georgia is the Law of Georgia "On Water". The rivers of Western Georgia flow into the Black Sea and thus affect the pollution of coastal waters. Modern management of water resources is based on an integrated approach. Therefore, the novelty of the dissertation is the numerical modeling of the distribution of pollutant concentration values in the water and bottom sediments of the Kvirila River.

Preventive environmental measures will be developed based on the modeling of the distribution of the polluting components of the Kvirila River and the assessment of the ecological situation.

15. Iori River is an important river artery of Eastern Georgia, it is mainly used for irrigation and water supply of the population. It should be noted that the Iori River is a typical example of a transit river, which originates in Georgia and flows into the Mingachauri Reservoir in Azerbaijan. This circumstance adds special importance to the river Ior and connects the two countries closely from a hydrological point of view. Therefore, a number of important issues that characterize it as a transit river should be considered. In particular: rational redistribution of water by water users and determination of the quantity, in addition to the quantity, water users need the appropriate quality of water, that is, depending on various water management tasks, it should be possible to use it. These principles must be respected not only between the water management objects located within one state, but also in the relations between the states, because the water that leaves the territory of one state must meet the norms, both quantitatively and qualitatively, so that it can provide the entire water

management system of the given neighboring country with water resources. This issue is more relevant in light of the current trends of climate change, when the limits of critical runoff levels are increased.

The novelty of the research paper is the determination of polluting sources and components, the study and determination of the chemical composition and sanitary-microbiological characteristics of water to assess the ecological condition of using the waters of the Iori River basin as a drinking-agricultural water supply system. Also, determination of the distribution area of pollutant concentration values by mathematical numerical modeling and development of protective preventive measures.

16. Processing of existing literature: - 2022 - 2024 Searching, introduction, analysis and preparation of the scientific literature related to the topic, modern works, articles published on the topic were studied and carried out. As well as writing and decorating the literary review of the topic and the introductory part.

17. The goal of the project is physical-chemical and microbiological research of solutions, polymer compositions, drinking and waste water, wine, fruit juices.

The direction of the project - microbiological research of wine, drinking and waste water aims to conduct microbiological research of wine, drinking and waste water. The indicator of total microbial contamination of water and the detection of bacteria of the enteric group in drinking water are of great importance. For microbiological analysis, it is especially important to select the soil and filter the analytical solutions, for which the latest type of dead-end micro- and ultrafiltration open-cell membrane device - bioreactor for microbiological analysis will be made in the laboratory.

Contamination of food products and drinking water is recognized as the main challenge of the 21st century, both in developed and developing countries, therefore the urgency of the project determines the need to increase the cost-effectiveness of water filtration for food industries and the population. Natural waters are mostly chemically and bacteriologically polluted. They contain various kinds of impurities, weighted particles, organic and inorganic substances, mineral substances, microorganisms that give water an unpleasant taste, smell and are dangerous for human health. The project provides solutions to global problems, such as providing the population with ecologically clean products and processing and manufacturing of high-quality drinking water manufacturing equipment and technologies.

Tangential micro- and ultrafiltration membrane devices provide effective removal of microorganisms and suspended solids, which leads to obtaining ecologically clean, crystal clear, long-lasting, stable high-quality products.

The relevance of the problem is due to the monitoring of the quality of wine, fruit juices, drinking and waste water processed through the membrane technologies and equipment created within the framework of the project with the existing physical and chemical research tools, many of which are designed for this research. One such tool is a bioreactor for microbiological research, which will be manufactured within the framework of the project.

All this ensures microbiological analysis of waters of various origins and management of necessary technologies for proper cleaning-sterilization and reduction of chemical components to acceptable limit concentrations.

Theoretical, experimental, microbiological, physical, chemical analyzes and appropriate tools and equipment will be used to solve the tasks planned in the project. Appropriate methods of conducting experiments on laboratory equipment for checking theoretical studies. Methods of conducting tests to evaluate the efficiency of work conducted in laboratory and production conditions. The quality of purity of research water, wine, other liquids and samples, the concentration of ionic, molecular, weighted, colloidal particles in the size range of 0.3nm-10μm will be checked with a turbidity meter (Turb 555 IR) and an ionomer (*И*-160. 1MP).

Increasing stability of solutions is carried out in an ultrasonic bath device (Unitra-Unima, UM-4, Olsztyn, Poland), and weighted particles are precipitated in a centrifuge device (CENTRIFUGE MPW-210, MPW. Med Instruments, Poland).

During the sterile-finish filtration of wine and drinking water, the analysis of bacteria (0.5-10 μm), rickettsia (0.4-1.0 μm), viruses (200-400 nm), fungi (3-50 μm) in the solution will be carried out on a microbiological reactor. Granulometric analysis of Na^+, Ca^{2+}, Cl^-, SO_4^{2-}, Mg^{2+}, Fe^{2+}, Mn^{2+}, NO_2^- ions (6-80 nm), hydrodynamic radii of microgel particles, and the index of permeability will be investigated with an analyzer (Zetasizer Nano Zen 3690- Malvern Instruments).

18. The development of ceramic production contributed to the improvement of human living conditions and provided a great service to the advancement of human culture. It is impossible to imagine ceramic production without construction products. Next to the traditional ancient building materials brick and tile, new different types of building materials have been formed.

The strength of ceramic products, the presence of a wide range of raw materials for their production, high sanitary-technical properties, fire resistance, water resistance, acid resistance, etc. They lead to the use of these materials in all fields of public economy. 70% of fire-resistant materials are fireclay products. Fireclay products are products made of refractory clays or kaolins infused with fireclay or non-plastic clays that do not get wet in water. Fireclays contain up to 40% Al_2O_3 and are the most common refractories. It belongs to aluminosilicate refractories. It is characterized by a different ratio of the main component oxides (Al_2O_3, Si_2O).

"Metekhis Keramika" LLC has been operating since 1986 and is equipped with modern European technological lines, which allows the production of high-quality ceramic construction material. To date, "Metekhis Keramika" LLC is the only full-scale production of ceramic building materials in Georgia.

Currently, 5 types of ceramic products are produced: brick, double brick, wall block B2.5, ceramic block B4, ceramic block B3. The factory has two identical ones

Technological line, each with a capacity of 30 million bricks/year.

The Metekhi village is located in the Kaspi region, on the right bank of the Mtkvari river, 560 m above sea level. at an altitude of 10 km from Kaspi. Kaspi Cement, Slate and Metekhi Building Materials Combines are large enterprises in the production of building materials in this region. Limestone and clay deposits are also located here, which are raw materials for building materials.

The main problem of environmental protection is the protection and safety of atmospheric air, hydrosphere, soil, biodiversity , protected areas, human health, the impact on the environment also includes the impact on cultural heritage or socio-economic factors caused by their change. Environmental protection is produced from different points of view: biological, ecological, hygienic, medical, technological, nature protection. In order to solve the problem of environmental protection, it is of great importance to introduce small and efficient technologies in production.

Since Metekhi ceramic tile production is located in the industrial region of Kaspi district, it follows from all of the above that it is necessary to evaluate the impact of the production facility on the environment, to determine the polluting sources and polluting substances of the environmental objects, solid wastes, the maximum dispersions of harmful substances polluting the atmospheric air and the maximum concentrations near the surface, runoff Maximum permissible amounts of substances weighed in water. Economic damage to the environment caused by industrial aerosols and waste water should also be evaluated, which is relevant.

The novelty of the paper is the design of environmental preventive measures, the processing of the scheme of the technological process of industrial aerosols and waste water purification, as well as the definition of the technical characteristics of the main purification devices.

19. The Third National Program of Environmental Actions for 2017-2021 (NEAP-3)4 approved by the Decree of the Government of Georgia on May 22, 2018 N1124, which is the main policy document in the field of environmental and natural resources protection, aims to provide clean and safe air for human health throughout the territory of Georgia. One of the goals of the 2018-2022 National Action Plan for Environment and Health of Georgia (NEHAP-2) is to reduce the harmful effects of atmospheric and indoor air pollution on the health of the population. NEHAP-2 includes 9 activities in the direction of ambient air protection. According to the experience of EU countries, in accordance with the requirements of Directive 2008/50/EC of the European Parliament and the Council of May 21, 2008, "On Ambient Air Quality and Cleaner Air in Europe", the territory of the country is divided into special units - zones and agglomerations for the purpose of managing ambient air quality. Air quality management plans are being developed for polluted units. According to the law "On Ambient Air Protection", the mentioned obligation for Georgia will come into force from 2022. However, the issue of atmospheric air pollution in big cities and among them the industrial zone of Rustavi is still relevant today.

St. A number of chemical and metallurgical enterprises operate in Rustavi: Rustavi Nitrogen, Rustavi Steel, Geosteel, Ruselois, Metal Construction Enterprise, Heidenberg-Cement and other enterprises, which are one of the main areas of employment for Rustavi residents. Near Rustavi, in Kvemo Kartli, there is also a mining and mining and beneficiation enterprise.

"Regular monitoring of atmospheric air quality in the region is carried out only in the city of Rustavi, with the help of one air quality measuring booth. The obtained data reflect the air quality of the entire city, but only of the area where the monitoring booth is located." , it is also visible from the outside area.

Polluted air can cause severe and multifaceted harm to human health. Therefore St. Based on the data obtained from the results of a number of studies conducted to determine the main polluting sources, substances and their concentrations of the atmospheric air of Rustavi industrial zone. The evaluation of the ecological condition of the atmospheric air in the industrial zone of Rustavi is very relevant.

The main goal of the work is to determine the spread of the main air polluting components of the Rustavi industrial zone and its surrounding area in the direction of the prevailing wind in a complex, numerical modeling, which represents the novelty of the dissertation topic:

For the first time, a numerical model of the evolution of the atmospheric and ecological processes of Rustavi and its surroun ding region will be developed, which will allow us to numerically calculate the distribution of passive and non-passive substances in the atmosphere;

The numerical model uses the system of nonlinear non-stationary three-dimensional equations of hydrothermodynamics of the atmosphere and explicit and implicit numerical schemes for its integration;

For the first time, the surface distribution of the dust deposited on the soil and the numerical modeling of its infiltration into the soil, as well as the study of its vertical distribution, are determined;

St. Preventive environmental measures will be developed based on the modeling of the spread of polluting components in the atmospheric air and soil of the Rustavi industrial zone and its surrounding area and the assessment of the ecological situation.

At this stage, a literary review has been prepared and studied. Ecological condition of the air in the working area of Rustavi.

20. Water resources are of great importance in providing favorable conditions for the population, economy, normal functioning, environment preservation. Providing the population with water was and is the priority task of our country for the normal functioning of the country. As in other countries, there is also an increase in water pollution in Georgia. The reason for this is the pollution of water bodies with insufficiently purified water and industrial waste, the reduction of natural water catchment areas, the destruction of forest massifs, the production of agricultural activities with incorrect methods. Solving the problem of the purity of natural waters is primarily related to the increase in the volume of wastewater.

Kvrila River flows in Western Georgia, in Sachkheri, Zestafoni, Terjoli districts and in the territory of Chiaturi City Council. It is the left tributary of Rion. The water of Kvirila River is used for irrigation and for the enrichment of manganese ore by gravity method.

Up to 260 million tons of raw ore have been mined in Chiatura, and up to 130 million tons of goods have been sold. Production association "Chiathurmanganum" by Md. 13.5 million cubic meters of water was released into the geyser, which was contaminated with various substances, including 1,449 tons of particulate matter and 37.2 tons of manganese. River in the village of Darkets. Black and white tributaries polluted with

industrial wastes join the scream, as a result of which the river Screaming water turns black. Due to this, the physico-chemical properties of water change, which affects the quality of river water purity, flora and fauna, as well as the health of the population, the water of the Kvrila river is unusable, both for drinking and for the technical water supply system.

Therefore, the main task of the scientific paper is the river. Carrying out ecological monitoring to determine the values of the main pollutant components of Kvirila basin. The main document of the state policy in the field of protection and use of water resources of Georgia is the Law of Georgia "On Water". The rivers of Western Georgia flow into the Black Sea and thus affect the pollution of coastal waters. Modern management of water resources is based on an integrated approach. Therefore, the novelty of the dissertation is the numerical modeling of the distribution of pollutant concentration values in the water and bottom sediments of the Kvirila River.

Preventive environmental measures will be developed based on the modeling of the distribution of the polluting components of the Kvirila River and the assessment of the ecological situation.

At this stage, a literature review has been prepared and the ecological condition of the Kvrila River has been studied.

21. The environmental impact of various wastes from the mining ore processing plant has long been the object of study by researchers in the relevant field. Despite many theoretical and practical works conducted over the years, the mentioned issue is still relevant today and requires ensuring the safety of environmental pollution with new modern approaches and methods.

As it is known, the acid quarry waters generated during the processing of the polymetallic quarry of the combine pollute the rivers: Mashavera, Kazretula and Foladauri. At the end of 2020, for the first time in Georgia, JSC RMG Copper installed modern chemical purification facilities. After their commissioning, pollution of surface water bodies was significantly reduced. Chemical purification facilities ensure the purification of acidic pit waters within the limits of the specified limit for RMG Copper.

Nevertheless, some heavy metals still remain in purified water, which do not meet ZDK standards. The purpose of this work is to select and implement such a modern method that will remove residual heavy metals from the purified water from the chemical treatment facility.

The work is in the initial phase, literature and informational materials are being developed

Familiarization, planning of research methods and conducting experiments. Special attention is focused on the sequence of tasks for phytomigration of residual heavy metals after chemical cleaning of acidic quarry waters.

22. The goal of the first stage of scientific research (2021-2022) was to initially collect general information about manganese, such as its properties, reception, industrial production and consumption, based on numerous information sources and by searching Internet resources; Scales of the volume of industrial production of manganese; secondary processing of manganese through recycling; Process chemistry and technological features.

Based on the activities of several Georgian and foreign companies related to manganese-free raw materials and their industrial utilization in Georgia, at the first stage of the research, it was necessary to get to know and study the technologies of small and medium-sized enterprises under the jurisdiction of these companies, in order to be able to choose one of them as the object of master's research. In order to make such a choice, the main criterion was the combination of traditional and modern approaches in technological solutions, thus the small capacity enterprise of "MN Chemical Georgia" LLC located in Rustavi stood out, whose main activity is obtaining manganese oxides as a result of chemical processing of manganese-free ores, which are currently quite It is a deficient product even in the international consumer market, and that is why it is in high demand.
In order to find out the possibilities of more efficient use of material and energy resources as secondary raw materials in industrial production, an initial introductory visit was made to the industrial enterprise belonging to the company selected as the object of master's research. A preliminary preliminary inspection of the selected research facility revealed significant losses of water consumed by the manganese-free raw material processing enterprise and a large amount of natural fuel consumption, as well as a large amount of solid production waste stored in the company's territory. In terms of a more thorough study of the physical-geographical and socio-economic environment.
Based on all of the above, in 2023, a detailed study and thorough analysis of the main technological process of the selected manganese-free waste processing enterprise is planned for the purpose of identifying polluting sources and harmful substances, based on the preparation of material and energy balances of the main production processes. It is also planned to discuss and study the existing purification system in the enterprise of atmospheric air polluting substances; Measures to be taken to minimize production and non-production waste generated in the enterprise will be determined.

Department: Metallurgy, Materials Science and Metal Processing

№	The name of the completed project, indicating the field of science and scientific direction	Years	Head of the project	Project performers
1	Development of the technology of making heat-resistant and anti-	2018-2020	M. Okrosashvili	Kh. Ananiashvili T. Loladze, G. Razmadze,

	radiation coatings on special purpose substrates. Engineering, Material Science;			T. Lomaia
2	"Development of a highly effective adhesively active metal binder for use in diamond composite materials", doctoral thesis. Engineering Sciences Materials science	2018	N. Loladze	M. Tserodze T. Pkhaladze Z. Avalishvili I. Dzidzishvili Z. Sulaberidze
3	"New high-performance diamond composite material and its production technology" AR-18-1911. 2. Engineering and technologies 2.5. Materials technology	2018.17.12 – 2022.17.12	N. Loladze	M. Tserodze Z. Avalishvili I. Dzidzishvili D. Nozadze
4	"Development of the technology of obtaining functional coatings on special purpose substrate" Scientific direction - 2. Engineering and technologies Subdirection - 2.5. Materials engineering Project number - PHDF-18-736	13.12.2018 – 12.12.2020	M. Okrosashvili	Kh. Ananiashvili - PHD Student Grantee

5	Development of a new technology for rolling seamless pipes. Field of science - engineering and technologies, direction - mechanical engineering. Project start date 10.01. 2022; Project finish date 20.12. 2022;	2022;	S. Mebonia	S. Chagelishvili M. Iadze
6	"Effect of structural factors of boron microalloyed high-strength bainitic cast irons on tribocorrosion under sliding dry friction conditions" Grant number: MR-21-232 Scientific direction - materials engineering	2022	N. Khidasheli	S. Gvazava PHD Student

Summarries

1. The technology of obtaining a coating of refractory metal - niobium on a copper base by evaporation of the initial material with an electron beam and subsequent condensation of the steam flow (by the method of electron -beam technology) has been developed. The morphology of the coating, microstructure of the cross-section and the degree of adhesion between the substrate and the coating are studied, as well as the dependence of these parameters on the thickness of the coating and the condensation (substrate) temperature of the steam flow. The optimum temperature range for vapor flow condensation, which provides the best adhesion between the copper substrate and the niobium coating, has been determined. It is 300-5000C. Under optimal conditions, a condensed coating with a thickness of 20–25 μm can withstand 12–13 degree deflections by ± 90^0 before cracking in the condensate. Based on the analysis of the state diagram of the Cu-Nb alloy system and theoretical calculations, it is assumed that the structural-geometric compatibility of their crystal lattices should play the most important role from the point of view of ensuring satisfactory adhesion between the copper base layer and the niobium coating. Thus, the experimentally established positive effect must be due to the formation of a coherent or semi-coherent boundary zone between the base layer and the condensed phase on the "base-condensate" phase separation surface, which is maintained at room temperature. The fact that neither the base layer nor the condensed film undergoes phase and structural transformations during the cooling process will undoubtedly contribute to the high degree of adhesion.

2. The aim of the work was the research of some aspects of obtaining metal-ceramic materials - Sal alloys, and accordingly obtaining a new composition for use in a specific, planned area.

On the basis of experimental studies, some technological aspects of obtaining a new composite material based on the CuTi - TiC - X system using the hot press method have been studied. The influence of PP-T parameters on the properties of metal-ceramic compositions is studied.

A program for impacting PP-T parameters is proposed, which allows obtaining materials with optimal complex properties under the conditions of liquid phase lubrication. Within the framework of the project, using new technological elements, an inexpensive, new composition diamond composite metal matrix was created - a binder with increased diamond holding capacity and wear resistance. In the process of obtaining the diamond composite, multi-component metal alloy compositions of pre-planned chemical and phase composition with a set of desired physico-chemical, thermo-physical, physico-mechanical properties were used; with properties such as adhesion to diamond, inertness to the graphitization process. In addition, with high heat transfer coefficient, flexural strength, ductility, impact viscosity, Young's modulus, Poisson's ratio. Obtaining the metallic component of the planned properties was carried out using modern smelting technologies and subsequent dispersion of the created alloy casts to obtain powders of the desired granulometry. The powders obtained by dispersing alloys were used to obtain diamond composites of the required geometry by the traditional powder metallurgy technology - hot pressing method. By adjusting the melting and crystallization modes, the phase composition and structure of the alloys were varied. The level of effectiveness of the characteristics of new compositions and structural alloys as metal binders on the performance of the diamond tool was identified and established. The operational indicators of the new composition of diamond composite materials obtained by the technology used within the framework of the project in diamond instruments were first determined on test laboratory stands, and the instruments with the best characteristics underwent extensive production testing at real production facilities.

3. The goal of the scientific Project was to develop a low-cost diamond composite material for diamond tools with improved performance compared to best existing analogues for use in various fields of industry. In the process of fabricating diamond composite, pre-determined chemical and phase composition multi-component metal alloy compositions were used. As a result of theoretical and extensive experimental studies, a multi-component copper-based alloy with a high content (7-13%) of carbon-active elements (Ti, Si) was selected as such composition. Fabricating the metallic component of the planned properties was carried out using modern melting technologies and subsequent dispersion of the created alloy ingots to obtain powders of the desired granulometry. By adjusting the melting and crystallization modes, the phase composition and structure of the alloys were varied. The main idea of the innovation is that for the formation of the metal matrix of the diamond composite, dispersed powders of the produced alloys were used in the sintering process, and not a mixture of powders of individual components (which is used by brand companies), which determines the special effect of the final result. The use of pre-alloyed powders as initial raw materials for the formation of the metal matrix of diamond composites no longer requires the use of expensive pure metal dispersion powders (which nowadays are widely used). All of the above-mentioned simplifies the technological process and that is why it is more cost-efficient. The use of new diamond composite material developed within the framework of the Project in diamond tools, in particular, the large-scale production tests on concrete cutting operation, demonstrated that the diamond

tools developed within the framework of the project are actually on the same level as the best foreign analogues in terms of cutting ability and durability. The obtained result is a precondition that the material created within the framework of the Project can be widely used in the construction field of our country.

4. The aim of the work was to study the peculiarities of coating formation in the process of condensation of vapor streams of refractory metals - niobium, tantalum and nickel on a copper substrate. Single-layer tantalum and niobium coatings were applied to the surface of the research samples using an electron-beam device. Niobium and tantalum powders, nickel, which were pressed in the form of cylindrical briquettes with a diameter of 50 mm and a height of 30 mm, were used as the initial evaporation materials, and before evaporation, they were melted in a vacuum with an electron beam. A flat copper plate was used as the base. Optimum temperature ranges of vapor flow condensation, which ensure the best adhesion of the coatings to the copper substrate, were determined. Metallographic analysis was performed. The macrostructure and cross-sectional microstructures of the samples, the phase composition of the coatings obtained on the gradient base layer and the degree of adhesion of the condensate to the base layer have been studied. X-ray structural and X-ray spectral studies of the samples have been carried out. Electron-microscopic study of the samples, X-ray phase, spectral-X-ray fluorescence, atomic-force microscopic analysis were carried out. The technology of obtaining Ta, Nb, Ni single-layer coatings on a flat base-layer of aluminum on an electron-beam device was developed. It was established that in the temperature range of 200-390°C, the niobium condensed layer is homogeneous and defect-free. Coatings condensed in the range of 200–340°C are characterized by a fairly smooth and uniform structure. The condensed layer shows no cracks or other defects and can withstand 12-14 degrees of bending. The composite retains its integrity even after the sample is completely fractured. was established that in the high-temperature zone, above the upper limit of the optimum condensation temperature, due to great supercooling and supersaturation, both stable phases of equilibrium and uncontrolled metastable phases are formed. Known AlNb2, AlNb3, NbAl3 compounds in the Al-Nb system, as well as metastable Nb2Al3, NbAl2 compounds have been identified. During the study of the condensation of refractory metal - tantalum vapor flow on the aluminum substrate, it was determined that the process of phase formation in the Al-Ta composite system, the quality of adhesion to the substrate and the obtaining of a defect-free, high-quality coating are affected by the temperature of the substrate (condensation). Above the upper limit of the optimal temperature range, reactive diffusion leads to the formation of an intermediate chemical compound Ta2Al, which, upon cooling of the sample, causes its cracking due to the impact of various physical and mechanical characteristics, which reduces the optimal tantalum condensation range for obtaining the best adhesion between the substrate and the coating - 200-320°C . As a result of X-ray structural research of nickel coatings on aluminum substrate above 320-350°C, the presence of NiAl, Ni2Al3 intermediate phases is revealed, which also worsens the quality of adhesion to the substrate in the coating.
5. The goal of the topic is to develop a scheme of an automatic pipe rolling station for the realization of a new technology of rolling seamless pipes and a new process of rolling pipes. A new technological process for making seamless hot-rolled pipes has been developed and a rational construction scheme of the automatic stand has been drawn up. Methodology for determining the main parameters of the deformation center for the new pipe rolling process. The geometric and deformation parameters of the deformation zone of the automatic stand are defined. The differential equations of the acting forces have been drawn up, their solutions have been obtained. Calibration of the technological instrument for the new pipe rolling process has been performed. Realization of the new seamless pipe rolling technology will allow us to increase the productivity and reliability of the automatic

pipe rolling mill, as a result of perfecting the pipe rolling scheme and reduce the plant's operating costs. The developed technology minimizes the number of times the split pipe is passed through the rolls, the auxiliary operations - removing the handle and installing it on the rod, turning the pipe, which simplified the technological process of pipe rolling and the construction of the stand, were excluded from the rolling process, which increased the production and reliability of the stand.

6. The materials used in modern technology are subject to such requirements as: multi-functionality, technological cheapness and long-term operation. Today, one of the most promising groups of construction materials includes high-strength nodular cast iron, which is distinguished by technological diversity. An actual problem is the reduction of wear loss under extreme operating conditions of bainitic cast irons. Wear-resistant materials should be characterized by high mechanical strength, thermal resistance, corrosion and wear resistance, and an optimal friction coefficient. High-strength bainitic cast irons are characterized by high tribotechnical characteristics, mechanical properties, strength, and the ability to control their structure in a wide range. Cast irons are alloyed with such ancient elements as Cu, Mo and Ni. Therefore, it is relevant to replace these elements with multi-factorial and relatively inexpensive elements. For example, microalloying liquid cast iron with boron not only reduces the cost of the technological process, but also leads to the formation of new, dispersed phases in the structure (borides, carbides, boron nitrides and carbo-nitrides), which will be located on the grain boundaries, which will likely have a positive effect on the set of operational properties of the material. The aim of the work was to study the influence of the structural factors of a new construction class material - boron microalloyed high-strength bainitic cast irons on their corrosion resistance and tribotechnical characteristics. The influence of boron micro-additions (B-0.03%) on the structure of bainitic cast iron was investigated. In order to determine the tribocorrosion characteristics of boron microalloyed high-strength bainitic cast irons, samples with different bainitic matrices were subjected to tribological studies in periodic wetting mode, during which the coefficients of friction, wear mechanisms and the kinetics of temperature change in the frictional contact zone were determined. The corrosive behavior of the mentioned samples was determined. The influence of the amount of residual asutenite on the kinetics of the change of the friction coefficient of the experimental samples was studied. The impact of structural factors on the tribocorrosion characteristics of boron microalloyed Bain Tour cast irons was determined, which allows for the purposeful optimization of the structure and ensures the effective use of this material for the production of various elements of brake systems and mill balls.

Department: Chemical and Biological Technologies

№	The name of the completed project, indicating the field of science and scientific direction	year	Head of the project	Project performers

1.	Production testing and optimization of an innovative automotive catalyst free of precious metalsnatural sciencesciences; 2. Engineering andtechnologies. **217020**	2016-2018	Doctor of technical sciences, academician Tamaz Natriashvili	T. Agladze (main performer) M. Donadze (principal performer) M. Gabrichidze (main performer)
2.	Development of waste utilization technology of manganese mining and beneficiation"; Field of Science: Engineering and Technology Identification Code: **AR-18-281.**	2018-2022.	Candidate of Technical Sciences - T. Lezhava.	Prof. J. Shengelia.
3.	Synthesis and study of high mechanical strength, polyesterurea class pseudoproteins. Project **PHDF-21-184.**	2021-2022 (18 months)	PhD student S. Kvinikadze	
4.	The scientific-research project financed by the grant of the Shota Rustaveli National Science Foundation, "Modification of Georgian clay rocks into porous materials for the filling of energy-efficient and weather-resistant concrete" Materials engineering - materials technology **AR-18-343**	19.12.2018-19.12. 2022 – (with submission of the final report in 2023).	Head from GTU Prof. T. Cheishvili, Overall Head M. Bazadze	The members of the consortium that performs to the grant - Technical University of Georgia, Iv. Javakhishvili house Tbilisi State University, Court named after Levan

				Samkharauliof the National Bureau of Expertise,K.Zavriev Institute of Construction Mechanics and Seismic Resistance.
5.	"For the engineering and technological preparation of the de-occupation of Abkhazia and Tskhinvali zone and reintegration with Georgia"	2022	Matsaberidze M.	Matsaberidze M.
6	Obtaining New Proteolytic Enzymes and Their Use in Improving the Taste Properties of Dairy Products. Agricultural directions, PHDF-2022 Doctoral Educational Program **PHDF-22-654.**	2022		Q. Museliani
7.	Young Scientist Research Grant Competition Winner project Obtaining periclase-alite highly flame retardant materials using local raw materials and production wastes. with code: **YS-21-1473**	2021/12/21-2023/12/21	Supervisor: M. Balakhashvili,	Mentor – N. Nizharadze
8.	Winner of the publishing state scientific grants competition Project "Physics and Kinetics of Anointing" with code: **SP-2-21-565**	2021	Supervisor: Z. Kovziridze,	Mentor-M. Balakhashvili

9.	The winning project in the competition of state scientific grants for fundamental research"Multifunctional nanocomposites in the B4C-TiCSiC-BN-Al2O3-SiAlON-Cb system for armor plates, turbine disks and wings, high-temperature and wear-resistant joints.. with code: **FR-21-1413**	2021	Supervisor: – N. Nizharadze,	coordinator - Z. Kovziridze
10.	Obtaining multifunctional ceramic composite materials on β - sialon matrix, with cheap raw materials and simplified technology, with code: **№ YS-18-077,**	2018/10/12 2021/31/01	Supervisor: –N. Darakhvelidze, .	Mentor- Z. Kovziridze Support Staff: M. Balakhashvili
11	Grant funded by the doctoral educational program: Synthesis and study of graphene/polymer nanocomposites for 3D printing **PHDF-22-575**	2022-2023	Mamuka Maisuradze	Doctoral candidate - Sofio Mikaberidze
12.	The method of cement production to clean flue gases from (CO2, SOx, NOx), before emission into the atmosphere by passing through a clinophthylolitesorber, to determine the applic ability by experimenting in	2022-2024	Prof. G. loladze	Prof. N. Kutsiava - researcher Acad. Dr. - E. Uchaneishvili (researcher)

	a laboratory environment, to prove the concept Materials engineering - materials technology **AR-22-1730**			
13.	CO2 sorbents based on natural zeolites, technology of synthesis/use/utilization Formulation of the concept of the idea, applicability Determination and validation in a laboratory environment by experimentation Materials engineering - materials technology **AR-22-2017**	2022-2024	prrProf. V. GoGordeladze	M. Kekelidze - researcher Acad. Dr. - E. Uchaneishvili (researcher)
14.	Study of physico-chemical features of enamels and glazes preparation, application technologies Grant competition "Science begins at school - research with the participation of students". "Engineering and technologies" **SCR-23-462**	18.09.2023- 24.03.224	PrProf. M. Kapanadze	Co-leader of the project - Kakutsa Cholokashvili's house. Chemistry teacher of the 178th public school, Acad. Dr. E. Uchaneishvili; Project assistant - PhD candidate A. Shkhvitaridze
	Scientific-research project (PhDF - PhD programme calls) "Using eco-	2023-2024	Heads of the community:	Ph.D student Tamar jibladze.

15	friendly biodegradable pseudoproteins for agriproducts preservation" funded by the Shota Rustaveli National Science Foundation grant. **PHDF-23-3114**. Project direction:		Ramaz Katsarava; and Tamar Palavandishvili.	

Annotations

1. Production testing and optimization of an innovative automotive catalyst free of precious metalsnatural sciencesciences

The goal of the project was to create a cheap and effective innovative nano hybrid catalyst free of platinum group metals. The main component of the nanohybrid catalyst is a silver nanoparticle (core) stabilized by oleic acid (shell) obtained by electrosynthesis on a rotating cathode in a two-layer bath. The hybrid catalyst is obtained by oxidizing the oleic acid shell molecules with a metal oxide precursor. AgMnOX (double, precursor KMnO4) and AgMnCrOx (triple, precursor K2Cr2O7) hybrid nanoparticles were synthesized by this approach, which showed catalytic activity for the oxidation of exhaust gases. Their effectiveness against toxic exhaust components was first evaluated in laboratory conditions on a gasoline engine. The catalytic converter was tested on a vehicle on a doling stand and in real operating conditions. The best sample was tested, which showed high activity towards the conversion of carbon dioxide and hydrocarbons. The activity towards nitrogen oxides was not high. As the tests showed, the degree of conversion of the nanohybrid catalyst is high in relation to CO and its concentration in the exhaust is 0.25%, the concentration of CH is 35-50ppm. The content of nitrogen oxides in the engine exhaust has decreased by 3-4 times (compared to operation without a catalyst), but its concentration is still within the permissible limits

It is higher than the concentration (900 ppm). Thus, the catalyst processed by us fully meets the requirements of the 2019 norms of technical inspection of vehicles in Georgia (when the nitrogen content is not controlled).

In order to improve the catalyst, a new plan was developed, which provides for the improvement of the three-component nanohybrid catalyst. Further research envisages the electrosynthesis of each component separately and by co-precipitation, which may be sufficient to increase the conversion quality of nitrogen oxides without the addition of precious metals.

2. Development of waste utilization technology of manganese mining and beneficiation

A two-step technology for processing man-made waste containing manganese in Chiaturi industrial basin was developed. As an intermediate product in the first step Technical electrolytic manganese dioxide is obtained, which is further processed The target product, manganese sulfate monohydrate, is obtained. intermediate at the anode At the same time the product is received at the cathode of the same electrolyzer Regeneration of divalent iron ions. Divalent iron ions participate in the ore in the process of recovery of existing MnO2. Thus, from ore to ore mabnganumsn Indirect electrochemical recovery method is used for extraction, which It excludes the release of greenhouse gas - carbon dioxide into the atmosphere, which takes place Manganese ores under standard technology conditions.

3. Synthesis and study of high mechanical strength, polyesterurea class pseudoproteins

Polymers have infiltrated almost every aspect of our life. However, the resistance of polymers to chemical/biological degrada tion has become a serious concern for the environment. This posed a challenge to modern polymer chemistry for the synthesis of degradable polymers (DPs) that will "disappear" after fulfilling functions. Numerous BPs were developed and are commercially successful today. Most of them belong to the polyester class. Relatively new BPs are those based on α-amino acids (AAs) - biomimetic polymers - synthetic analogues of proteins.

Pseudoproteins (PPs) are obtained by polycondensation of key monomers - diamino-diesters (DADEs) with various bis-electrophiles. Simplicity of synthesis and cheapness, high yields (90-95%), and purification by recrystallization from water, and no ecologically undesirable toxic wastes determine the manufacturability of DADEs. This leads to the cost-effectiveness of a variety of PPs, their potential for both medical and engineering uses. The best for the latter applications are the PPs of poly(esterurea) class-PP-PEUs. The PP-PEUs first were obtained by Katsarava et al. Today PP-PEUs are the most strong BPs - Young modulus ≈6.0 GPa that is significantly higher compared to other high-modulus BPs. PP-PEUs were handed to the Akron U.(USA) by Katsarava for applications in bone surgery. High-strength PP-PEUs are also promising as eco-friendly engineering plastics, which are the subject of our research. The project aims to synthesize and study a new generation of rigid-chain PP-PEUs having higher strength compared to existing ones.

The project comprises synthesis of new key DADE-monomers constituted of rigid cyclic diols by direct thermal condensation of the diols with AAs in the presence of p-toluenesulfonic acid, in a refluxed organic solvent. We will use two AAs - L-leucine and L-phenylalanine as suggested previously by Katsarava and co-workers to carry out a comparative study of the new PP-PEUs with reported ones made of flexible 1,6-hexanediol. Thus the project aims to carry out a comparative study of the reported (flexible-chain) and new (rigid-chain) PP-PEUs under adequate conditions.

The scientific value of the project is the first synthesis of the new DADE-monomers of rigid skeleton and rigid-chain new PP-PEUs. We can assume other classes of PPs obtained from the new monomers – such as PEA and PEUR will also be of high interest for applications in medicine/veterinary, agriculture, food industry, packaging, engineering, and other eco-friendly materials. The world market of such materials is quickly growing – 20-25% per year.

4. Modification of Georgian clay rocks into porous materials for the filling of energy-efficient and weather-resistant concrete

The grant provided for the monitoring and preparation for research of clay shale, argillite, and light clay deposits, modifying them in the temperature range of 500-700^0 C and 1100-1200^0 C to obtain light energy-efficient ceramsite concretes.

According to the agreement, the clay, argillite and clay shale of three locations were treated with the prescribed thermal regimes based on previous studies with the participation of the employees represented by the consortium member STU. The product obtained from them by low-temperature processing (600-8000 C) was purposefully used as pozzolanic cement additive. Also, by high-temperature (1150-1250^0 C) modification of a number of clay rocks of Georgia (Kvarli clay shale, Teleti argillite and Gardabani clay), it was determined to obtain a lightweight concrete filler - ceramsite based on them. In order to obtain light concrete from them, presentation samples were prepared based on the developed recipes.

The material was collected for advertising documentation, which includes the description of the technological processes of the products obtained by temperature transformation of Georgian clay rocks and the methods of obtaining products from them. This material will be used for transfer and commercialization purposes on the creation website. The report was submitted in August 2023.

5. For the engineering and technological preparation of the de-occupation of Abkhazia and Tskhinvali zone and reintegration with Georgia

Constant monitoring should be carried out by scientific institutions of Georgia and with the participation of relevant international institutions to assess the negative changes that followed the Russian occupation and continue to this day in the economy, natural environment, biodiversity, social-political, legal, cultural, intellectual property and all other aspects of Afzakheti and Shida Kartli. , what the citizens of the occupied regions of Georgia need for their own, universally

To exercise declared legal rights. It is an urgent necessity to immediately start creating a strategic plan for the sustainable development of Abkhazia and Shida Kartli for reintegration into the economy of Georgia after de-occupation. Scientific (here we mean agricultural, bio-medical, chemical-technological, physical-technical,(cultural and other fields) maintaining the potential to restore and continue the interrupted researches in the occupied regions in the scientific institutions of Georgia until the time of de-occupation and reintegration with Georgia comes.

The scientific institutions of Georgia with the appropriate profile should immediatelyStart systematic monitoring of the negative processes initiated by Russiaoccupation and is manifested in the natural and land resources of Abkhazia and Shida Kartliwith a predatory attitude on the part of the Russian state.

6. Obtaining New Proteolytic Enzymes and Their Use in Improving the Taste Properties of Dairy Products.

The modern dairy industry primarily utilizes two distinct methods for the production of dairy products: bacterial fermentation and enzymatic processes. Bacterial fermentation yields products like sour cream, kefir, and yogurt, wherein milk undergoes curdling. In contrast, enzymes, through coagulation, are responsible for the creation of cheese and its various varieties.

This research project focuses on isolating a producer organism from spoiled dairy products capable of synthesizing a unique enzyme or enzyme complex. This novel enzyme, in contrast to typical broad-specificity proteases, curdles milk without extensive hydrolysis. The result is a dairy product with heightened fatty flavor properties, distinguishing it from conventionally enzyme-coagulated masses and offering a fresh product perspective.

Moreover, this distinctive enzyme's expression manifests in elevated fatty taste characteristics, making it suitable not only for creating new dairy products but also as a synergistic enzyme when combined with other enzymes and bacteria. This collaboration enhances and refines the taste attributes of the final product.

The project's initial phase involved the isolation of microscopic fungi cultures from various spoiled dairy sources. Screening identified a fungal culture whose proteases possessed milk-degrading capabilities. Optimal cultivation conditions for protease biosynthesis were then determined through deep fermentation, considering factors such as temperature, pH, and time.

The project's ultimate goal is to isolate this innovative enzyme-protease with novel properties. This enzyme will undergo chromatographic or partial purification, molecular characterization through electrophoresis, and analysis of physicochemical properties, including activity, pH, and temperature optima. These parameters will aid in selecting industrial production conditions and developing a preliminary technological process for both creating new dairy products and enhancing a wide range of existing ones.

Notably, the product produced using this new protease is not only easier to digest but also showcases enhanced taste properties without increased fat content. This dietary advantage positions the product as an innovative addition to the dairy market, revolutionizing the role of traditional cottage cheese.

7. Obtaining periclase-alite highly flame retardant materials using local raw materials and production wastes.

The goal of the present project is development of technology for manufacture of new refractory materials by the use of local raw material and industrial wastes.

For lining of the most high-temperature zone (baking zone) of metallurgical thermal aggregates and of rotary cement sintering furnaces various mark (ХМЦ, МХЦ, ПШЦ and others) magnesite refractory bricks are used. The products contain MgO in more than 66 mass%. It provides for high refractoriness of these materials, high temperature of deformation starting and high chemical stability. They are distinguished by high refractoriness at > 1900^0 C (refractoriness of pure periclase is 2800^0C) and by increased resistance to the alloys of base properties and those containing iron.

In recent years in many countries of the world the increase in a demand of magnesite refractory materials was observed and the resolution of the issue of their economy and rational application became evident. The researchers were faced with a task to search the possibilities to replace magnesite refractory materials by any other refractory materials of base properties, or to improve exploitation properties of the existing refractory materials.

Refractory materials are not manufactured in Georgia and demand on such material is satisfied at the expense of costly imported materials.

As a result of work implemented within the frames of the Project we studied dolomite and serpentinite deposits of Georgia and their fitness for obtaining dolomite-serpentinite clinker of high physical and technical properties was proved. Impact of various binders and carbon-containing additives on physical-technical properties of composites was investigated and carbon-containing composite of optimal composition was obtained advanced technology of fabrication of products (brick) and gunite was developed and technological schemes were drawn up.

The objective of the present project is: 1. Application of cheaper raw material, sand from Croli deposit and magnesite brick wastes/fragments: for obtaining refractory objects. 2. Obtaining of high refractory material with high temperature of starting softening and high chemical stability; 3. Expansion of raw material base;

According to our opinion insertion of silica SiO_2 into charge by means of sand from Croli deposit will provide for thorough binding of CaO obtained as a result of destruction of dolomite, while fragments of magnesite brick will increase MgO concentration in the charge. It should be stated that at this time it will be possible to regulate MgO content in the obtained material independently from silica, which is most significant

Realization of this technology is planned at the Dzirula Enterprise of Refractory Produce, which at present stands idle, but all segments of it (preparation of raw material, dosing, mixing, forming, drying, sintering) are ready for operation. The enterprise possesses all technological devices to manufacture high quality refractory material.

Within the framework of the program "Produce in Georgia", the enterprise has received the necessary funding to start working and it is ready to implement the technology of dolomite-serpentimic carbon-based composite [brick] processed by us. After completion of works stipulated by the project submitted by me the enterprise will be able to give advantage to the technology by the provision of the obtained results and economy.

8. Physics and Kinetics of Anointing

According to the monograph the matrix and performance properties of the ceramic composite material are related to one of the main constituents of the phases in it — the porous phase, which has a significant influence on the operating properties; how the pores are evolving, redistributing– moving, annihilating, healing - disappearing, or deforming on the material under conditions of thermal aggression, consolidation, and burning. All the five mathematical formulas developed by me were tested for the properties of the synthesized materials presented in the monograph, both solid and mixed, as well as during liquid-phase sintering.Physico-chemical processes in the composites based on carbides, borides, nitrides and silicides are discussed. On the basis of perlite is adopted a simplified and inexpensive innovative technology of low-temperature products, which was introduced in Ukraine, in Svetlovodsk porcelain factory and 11 factories in Georgia. Roasting temperature dropped to 350 ^{0}C. The economic effect amounted to tens of millions. Mathematical calculations of material consolidation processes in the heat treatment process are performed.

For barium-containing celsian materials, completely new types of chemical reactions are given in the synthesis process of products, for the single-stage technology instead of two-stage technology, One procedure conducted at 1600 degrees is removed from the technology, which has resulted in a high economic effect. In a stereologically three-dimensional system, the dynamics of the crystalline phase development in the composite depending on the fourth variable-temperature are studied. This simplified and innovative technology was introduced at the pilot-producing plant of the JSC "Saqsashenmetsniereba" (former Research Institute of Building Materials and Experimental Factory). Seven types of electrical products were sent to Russia. This has brought millions of economic effects.

The technology of production of engine parts on the basis of silicon nitride obtained by hot press nitrogen process has been introduced at the Tractor Plant in the city of Vladimir.The operating properties of the composites for both xenomorphic and idiomorphic structures have been studied. Composites in B4C-SiC-Si-Al-Al2O3 system are obtained and then studied.

The monograph consists of 680 pages.

9. Multifunctional nanocomposites in the B4C-TiCSiC-BN-Al2O3-SiAlON-Cb system for armor plates, turbine disks and wings, high-temperature and wear-resistant joints..

One of the most important directions for the development of modern equipment is the acquisition and use of highly fire-resistant materials. First of all, it is related to the increase of working temperature in energy, transport and other types of installations. Increasing the level of high temperatures significantly determines the development of atomic energy, space and rocket technology, metallurgy, chemistry and other fields of science and technology.

High-temperature materials should have high strength, chemical resistance and other properties that ensure the expediency of their use. The possibility of creating such materials is determined by the use of non-oxidizing refractory materials, namely: 1. Metal-like materials; 2. non-metallic refractory materials: carbides, nitrides and others; 3. Metal refractory materials.

Despite the great advantage of materials derived from high-refractory oxides (high density and strength, including at high temperatures, resistance to the effects of oxidizing environments), it is mainly characterized by a high coefficient of thermal expansion and, as a result, low thermal resistance.

Ceramics of oxygen-free refractory compounds, in particular, silicon carbide, on the contrary, are characterized by low thermal resistance in conditions of high strength and toughness, but easily oxidize starting from 12000C. In addition, oxygen-free compounds (carbides, nitrides, silicides, borides) are poorly baked. The research topic refers to a very topical issue - obtaining new advanced technical multifunctional ceramic materials (composites) based on highly refractory oxides and refractory non-oxidic compounds.

The necessity of such an approach is caused by the problems mentioned above, so obtaining such a composite that combines the high functional characteristics of both oxide and non-oxide compounds and reduces their deficiency is an urgent task of modern materials science. Sialons belong to such materials.

10. Obtaining multifunctional ceramic composite materials on β - sialon matrix, with cheap raw materials and simplified technology

According to the purpose of the project, the full scope and relevance of the planned work were carried out to obtain composites containing high performance properties. An analysis of existing literary sources was conducted around the project issue. A new innovative technological approach was used to obtain the SiAlON. The innovation was to obtain composites of the desired phasic composition by the method of reactive sintering and hot pressing in the complex process of alumothermic and nitrogenize. To obtain a solid solution of SiAlON, which is carried out by the incorporation of α-AL_2O_3 and AlN into β-Si3N4, we chose natural, chief raw kaolin, aluminum fine powder and silicon. The synthesis of SiAlON was carried out by the reduction of SiO_2 to silicon with aluminum. SiO_2 was formed during the decomposition of kaolinite during the baking of the mixture, which at the same time binds to nitrogen and forms Si_3N_4. AlN obtained by nitrogenation of the aluminum powder interacts with α-AL_2O_3, which is obtained by oxidation of the aluminum powder. Al_2O_3 will incorporate into the Si_3N_4 crystalline lattice by obtain of SiAlON. This is easily accomplished through newly created components. SiAlON matrix composites were obtained by reaction sintering and subsequent hot pressing by adding silicone matrix reinforcing components - silicon carbide and aluminum oxide.

The physical-mechanical properties of the obtained composites and the influence of silicon carbide and corundum addition were determined. Phase composition analysis was conducted by scanning electron microscopy, X-ray structural and micro-X-ray spectroscopy.

Project results and effects: The optimal conditions for consolidation of ceramic composite materials CH-6, CH-7, Ch-8 (pressure humidity) were determined, sintering conditions (temperature, sintering parameters). Compared to traditional methods energy consumption is reduced and simple production method is developed. The resulting composites are characterized by high density and hardness.

11. Synthesis and study of graphene/polymer nanocomposites for 3D printing

Since the beginning of the new millennium, the concept of "3D" has firmly entered our everyday life. Three-dimensional printing technologies provide us with new opportunities in creativity, science, technology and everyday life. A 3D printer, i.e. a three-dimensional printing device, is a unique modern tool, through which it is possible to print from the smallest, nano-sized details to macro and huge objects. In 3D printing technology, a digital model of the structure of the object is initially created in the computer, which is connected to the printer and starts creating a layer-by-layer product as a result of giving the appropriate command. The advantages of 3D printing compared to conventional printing are high speed, simplicity and relatively low cost.

3D printer is actively used in various industries: construction industry, medicine (for example, for the production of various organs, new generation prostheses), furniture production (for example, modeling restoration samples and creating an exact analogue), toy production (for example, various figurines and board games , inscriptions and twelves), the food industry (for example, the production of chocolates of the most difficult shape), the production of clothes and shoes (for example, the creation of new, unusual models) and others.

The goal of the project is the synthesis of graphene/polymer nanocomposites, structural-morphological research, by IR, UV and Raman spectral methods, electron microscopy and thermography. with ¬vimetric analysis.

12. The method of cement production to clean flue gases from (CO2, SOx, NOx), before emission into the atmosphere by passing through a clinophthylolitesorber, to determine the applic ability by experimenting in a laboratory environment, to prove the concept

Climate change towards global warming is the biggest problem of humanity of the 21st century, its prevention is also the biggest challenge and a priority task. The study offers an innovative method of prevention of irreversible emission of cement production flue gases (CO2, SOx, NOx) into the atmosphere and utilization in the composition of cement (concrete).The purpose of the research is to prove the concept of cement production by experimenting in a laboratory environment, to determine its applicability.

The result is: from the TRL-1-level of the preliminary patent search of the “Cement production method”, the production of the required mass of cement by experimentation in a laboratory environment (TRL-2 level), determining the applicability in concrete and the concept determine the result is: from the TRL-1 level of the preliminary patent search of the “Cement production method”, the production of the required mass of cement by experimentation in the laboratory environment (TRL-2-level), determination of the applicability in concrete and approval of the concept (TRL-3-level), finally the technology transfer TRL-4 Reaching level.

13. **CO2 sorbents based on natural zeolites, technology of synthesis/use/utilization Formulation of the concept of the idea, applicability Determination and validation in a laboratory environment**

by experimentation

Due to the aggravation of the warming problem, the prevention of CO2 emissions in the atmosphere with flue gases has become a priority task that requires appropriate technologies and specifically solid sorbents. There is a shortage and high cost of CO2 solid sorbents on the market, which prevents the creation and development of CO2 sorption capture and utilization technologies from flue gases.

The aim of the research is to prevent CO2 in the atmosphere with flue gases using cheap, non-deficient natural sorbents. The essence of the project is to synthesize CO2 "capturing" solid sorbents from flue gases by Synergy of sorption abilities of natural and artificial sorbents. To formulate the concept of the technological idea of synthesis, use, utilization, to determine the applicability and to prove it by experimenting in the laboratory environment.

14. **Study of physico-chemical features of enamels and glazes preparation, application technologies**

Grant competition "Science begins at school - research with the participation of students".

Grant project "Science begins at school - research with the participation of students"

It is relevant and original, its purpose is: to raise the quality of education of students of general educational institutions, to bring school education and scientific research closer together, to integrate scientific research into the learning process at school;

Through familiarization with scientific field literature and popularization of researches, interest of schoolchildren in a specific field of science;

Promotion of development of skills of students to conduct scientific research and analyze the results;

Pupils of 178 public schools of Tbilisi received the material and technical base of the Department of Chemical and Biological Technologies of the Technical University of Georgia to fulfill the grant.

15. **Using eco-friendly biodegradable pseudoproteins for agriproducts preservation**

Problems of preservation of fruits and vegetables are relevant because they are perishable products. Keeping it fresh and with a good appearance is a challenge all the time. Today, such methods of storing agricultural products as canning, drying, vacuuming, freezing, and covering with wax or foam

have been replaced by an innovative method - covering food products with a thin polymer coating. Such films control the diffusion of water and gases, prevent the colonization of the surface of products with bacteria and other microorganisms, and decrease the content of vitamin C and other important useful components. The increasing interest in edible and biodegradable films for food packaging is becoming more evident every day, as non-degradable materials do much damage tohuman health and the environment. Monocomponent pseudoprotein biodegradable food coating filmsare used in this experiment. Polymer alcoholic solutions of different concentrations were prepared, with which samples of apples and carrots w ere covered by the method of dip-coating. Through the mathematical planning of the experiment, the storage capacity/shelf-life of agricultural products with pseudoprotein food coating was investigated.The optimization parameter of the study is water-soluble dry matter, and temperature, concentration of coating materials, and storage time are selected as factors affecting the optimization parameter. In the conditions of long-term storage of products, based on experiments and visual observation, the storage capacity of coated samples will be determined in comparison with uncovered samples.

Department of Chemistry

№	The name of the completed project, indicating the field of science and scientific direction	year	Head of the project	Project performers
1.	Performed on etrati Codicological analysis of fragmentary manuscripts and material structure research (grant) Rustaveli Georgian Science Foundation Korneli kekelidze National Center of manuscripts	2020-2023		T.Abuladze Sh.Tavadze R.Kldiashvili N.Megrelishvili L.Axobadze
2	Hygienic assessment of labor process by LEPL Korneli kekelidze. Georgian National Center of manuscripts ISSN 1512-0538	2020-2023		R.Javachadze M.Arabidze M.Qvatadze R.Kldiashvili I.Jiqidze

3	Engineering Sciences; Material technology. AR 18-1911 "New high-tech Uri almascompositional material and technology of its reception"	2018 - 2022	N.Loladze	M.Tserodze Z.Avalishvili I.Dzidzishvili D.Nozadze
4	Project of preparation and publication of the collective monograph, C-04-18; natural and Exact Sciences: interdisciplinary approach	2018	NauCorp "Povolzhskaya Scientific Corporation O.Podkopaev	I.Berdzenishvili
5	Physico-chemical research of corrosive behavior of structural metal and selection of effec-tic inhibitor to protect it from acid corrosion; physical chemistry		I.Berdzenishvili	N.Shavishvili
6	Challenges for Higher Education in the era of Covid19 and the next day" Academic	2020	Hellenic Mediterranean University, Athena European University	I.Berdzenishvili
7	Sigma Xi work promotion program; academic	2021	Sigma Xi The Scientific Research Honor Society	I.Berdzenishvili
8	Erasmus + PRINTeL project master classes" teachers in digital virtual space " academic	2021	Erasmus + PRINTeL	I.Berdzenishvili
9	Participation in the project of preparation and publication of collective	2022	Scientific Publishing	I.Berdzenishvili

	monograph-65; natural and Exact Sciences		Center "AETERNA"	
10	Imperial English UK,	2022	სტუ, Imperial English UK	I.Berdzenishvili

Annotations

1. "Codicological analysis of fragmented manuscripts made on the etrate, and the study of the structure of the material"

The aim of the project is the interdisciplinary study of Georgian handwritten fragments performed on the etrate: codicological research, determination of artistic value, diagnosis of the structure of manuscript material and determining the conditions of preservation, creating a database and the inclusion of existing material into the international scientific circulation.

There are 1300 units of fragmented manuscripts in the collection of Georgian manuscripts (A, S, H, Q) stored at the Korneli Kekelidze National Center for Manuscripts. The total number of fragments made on the etrate is 333 units. Their chronological frames cover IX-XVI centuries. Multicomplex study of manuscripts, the study of the structure of manuscript material from a codicological point of view is an innovation, a comprehensive textological and codicological study of the manuscript and the study of the structure of the manuscript material, including fragments of manuscripts, referring to the requirements of a completely new area of codicology, fragmentology, was never carried out.

The project has been provided for the study of the material of fragments according to the latest modern diagnostic methodology using appropriate equipment. This direction is carried by Revaz Kldiashvili, the head of the scientific laboratory for the preservation and restoration of the center, professor of GTU.

Erich Renhart, professor of the University of Graz (Austria), the supervisor of the manuscript department and the special collection of the library of the University of Craz takes part in the project as a consultant.

2. Determination of the negative impact of the working environment on the health of an employee and its recognition requires a full, comprehensive assessment of factors harmful to health in a particular place.

The working conditions of employees were studied in the Department of Scientific Restoration and Conservation of Korneli Kekelidze Georgian National Center of Manuscripts - in the bookbinding, restoration, chemical and preparation laboratories, in the storages of: Zhordania No. 68, personal archival funds No. 69, Ekvthime Takaishvili No. 67, and in the reading room.

The air of the working area was examined for the content of fibrogenic aerosol (dust), chemicals, mold fungi. The state of noise, microclimate, lighting conditions (natural and artificial), heaviness (intensity) and labor intensity were studied.

The studies were carried out using standard methods being in force in Georgia, by using certified equipment.

Classes of working conditions for individual jobs - professions are identified, groups of assumed occupational risk are determined. The working conditions of employees at the studied workplaces according to the hygienic classification on the basis of a comprehensive assessment belong to 3 classes according to the degree of harmfulness 1; 2; 3.

The less harmful class 3.1 included the jobs of the security guard of the storage of photo-micro films, the chief specialist of the chemical laboratory of the scientific department of restoration and restoration.

Class 3.2 included the working conditions of employees in the restoration rooms of the same department, in storage rooms and reading rooms.

Class 3.3 included the working conditions of employees in the preparation rooms of the restoration and conservation laboratory and in the bookbinding room, which is mainly associated with noise, heaviness (intensity) and labor intensity.

Based on the research carried out, measures have been developed to improve the health and working conditions of workers in the form of recommendations.

3. The goal of the scientific Project was to develop a low-cost diamond composite material for diamond tools with improved performance compared to best existing analogues for use in various fields of industry. In the process of fabricating diamond composite, pre-determined chemical and phase composition multi-component metal alloy compositions were used. As a result of theoretical and extensive experimental studies, a multi-component copper-based alloy with a high content (7-13%) of carbon-active elements (Ti, Si) was selected as such composition. Fabricating the metallic component of the planned properties was carried out using modern melting technologies and subsequent dispersion of the created alloy ingots to obtain powders of the desired granulometry. By adjusting the melting and crystallization modes, the phase composition and structure of the alloys were varied. The main idea of the innovation is that for the formation of the metal matrix of the diamond composite, dispersed powders of the produced alloys were used in the sintering process, and not a mixture of powders of individual components (which is used by brand companies), which determines the special effect of the final result. The use of pre-alloyed powders as initial raw materials for the formation of the metal matrix of diamond composites no longer requires the use of expensive pure metal dispersion powders (which nowadays are widely

used). All of the above-mentioned simplifies the technological process and that is why it is more cost-efficient. The use of new diamond composite material developed within the framework of the Project in diamond tools, in particular, the large-scale production tests on concrete cutting operation, demonstrated that the diamond tools developed within the framework of the project are actually on the same level as the best foreign analogues in terms of cutting ability and durability. The obtained result is a precondition that the material created within the framework of the Project can be widely used in the construction field of our country.

4. In the monograph prepared within the framework of the KM-04-18 project, scientifically based theoretical and methodological approaches and specific recommendations are proposed to solve the current problems in the field of natural and exact sciences. The monograph is intended for a wide audience of readers interested in these fields of science.
5. The project deals with the phormal-mathematical modeling of the corrosion resistance of steel materials in H2S environments. In this study the corrosion dynamics of metal test specimens completely immersed in electrolyte solution containing hydrogen sulfide was evaluated over a period of 3 month. As a result of mathematical-statistical processing of the data of the kinetic experiments, an algorithm for assessing the reliability of steel materials was obtained, which will make it possible to predict the limiting state and guarantee resource of construction-building in corrosive media. To minimize hydrogen sulfide corrosion of metal constructions two preventive methods are proposed.
6. The Hellenic International Relations Office of the Hellenic Mediterranean University from Greece and EVM, an SME from Spain, involved very actively in the Erasmus & Horizon 2020 projects and the ATHENA European University Consortium took the initiative to organize a Webinar focused mostly on the challenges of Academic Teachers along their transition from face to face teaching to online teaching.

All the speakers participating in this project have expertise in online teaching technology, online teaching pedagogy and online teaching offered emotional support.

It was an immediate, efficient and effective response to the challenges posed by the Covid19 pandemic to students, academic teachers and universities. The critical issues facing a group of stakeholders in the field of higher education was considered.

7. Over the years, my involvement has been instrumental in furthering Sigma Xi's mission to improve the health of the research enterprise, promote integrity in science and technology, and promote public understanding of science to improve the human condition. The society expressed gratitude for my continued supporting the next generation of scientist and engineers.
8. On September 8, 2021, the master classes of the Erasmus + PRINTeL project "Teachers in Digitalized Virtual Space" were held.

With the PRINTeL project (Project PRINTeL - "Change in the classroom: supporting innovative learning and teaching to activate students' learning practices in Eastern Partnership countries").

The master classes intended for university teachers gave the participants the opportunity to gain practical skills in innovative pedagogy and learn about the latest techniques in modern digital teaching methods and approaches.
With interactive audience participation and relevant classroom lessons, the masterclasses focused on the use of various online/digital teaching and learning (T&L) methods and tools.

9. The collective monograph published within the framework of the KM-65 project is a visible example of interdisciplinarity. Representatives of a number of natural and humanitarian sciences unite to present a number of current theoretical and practical issues of scientific development. The work is structurally a combination of thirteen parts, which are dedicated to the concepts, theory and methodology of fundamental and applied scientific research. The monograph discusses the implementation of a systemic approach in industrial waste management, digital technologies, ecological entrepreneurship in the unity of its main components, inter-industry interaction, implementation of modular-situational technologies, the health-saving position of young people, the issue of individualism in modern society and its impact on cultural identity, and many other issues.
10. The collaboration between GTU and the British Language Academy "Imperial English, UK" envisages the teaching of the English language using the latest methodology and technologies. The training was conducted online. Within the framework of this project, in June-November 2022, the academic staff of the Technical University was trained to improve their English language skills. The relevant certificate has been received. The courses were conducted by experienced and qualified instructors who are experts in their field. A worldwide recognised certificate in the English language has been received.

Faculty of Law and International Relations

Completed Projects

№	The name of the completed project, indicating the field of science and scientific direction	Year	Head of the Project	Project Performers	Annotation
1	International Court in the System of International Relations, International Relations	2018	Epiphane Gvenetadze	Irakli Gabisonia, Jemal Gabelia, Ana Futkaradze, Elene Chaladze, Lali Kakashvili, Tamar Baramia	The project was financed from the budget of the Faculty of Law and International Relations. The

					project aimed to determine the role of the international court in international relations.
2	"Gender Equality and Discrimination: Political-Legal Aspects", Law	2018	Maia Kipiani	Irakli Gabisonia, Tsiala Gloveli, Beso Sekhniaidze, MananaDarchashvili	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a supporting manual was created, which reflected the political-legal aspects of gender equality. Within the framework of the project, a number of trainings, public lectures and master classes were held in order to raise public awareness.
3	Engineering Law (technological law),Law	2018	Irakli Gabisonia	Archil Prangishvili, Vakhtang Zhvania, Teimuraz Bezhoshvili, Jemal Gakhokidze, Ana Putkaradze, Giorgi Goradze, Ketevan Jincharadze, Jemal Gabelia, Koba Kalichava, Malkhaz Chitaia.	The project was financed from the budget of the Faculty of Law and International Relations. The goal of the project was to create a new branch of interdisciplinary law: engineering law, transport law, energy law. In order to establish the mentioned field, syllabi and study materials, scientific articles and manuals were prepared.
4	Philosophy of Justice and Modernity, Law	2018	Irakli Gabisonia	Aleksandre Taliashvili, Salome Khizanishvili	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual was created, in which the current issues of the philosophy of justice and modern law were presented as a result of scientific research
5	Methods of Law, Law	2018	Givi Lobzhanidze	Davit Lobzhanidze	The project was financed from the budget of the Faculty of Law and International Relations.

					Within the framework of the project, a manual on legal methods was published, which was reflected in the study syllabus.
6	International Legal Systems and Local Self-government, Law	2018	Irakli Gabisonia, Givi Lobzhanidze		The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual was published, which was reflected in the study syllabus.
7	Children's Rights, Law	2018	Sophio Demetrashvili	Nato Gugava, Nana Kharadze, Khatia Vasadze, Tamar Baramia, Eka Ruseishvili	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, an illustrated children's constitution was published, a conference, training and workshops were held for students and pupils. Commentaries on the Code of Children's Rights were also published.
8	Problems of Family Violence in Georgia, Law	2018	Maia Kipiani		The project was financed from the budget of the Faculty of Law and International Relations. The goal of the project was to create a new branch of interdisciplinary law: engineering law, transport law, energy law. In order to establish the mentioned field, syllabi and study materials, scientific articles and manuals were prepared.
9	Modern International Relations, International Relations	2018	Igor Kveselava	Epiphane Gvenetadze	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual

					was published, which was reflected in the study syllabus.
10	On Creating a Criminology Monograph, Law, Criminology	2018	Gabunia Mikheil		The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual was published, which was reflected in the study syllabus.
11	Harmonization of Georgian Legislation in Accordance with the Requirements of the Association Agreement with the European Union, Law	2018	Mariam Jikia	Malkhaz Chitaia, Ketevan Guguchia, Vakhtang Zhvania, Ketevan Jincharadze	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a collection of works was published, which was reflected in the study syllabus.
12	Cultural Law	2018	Irakli Gabisonia	Revaz Mishveladze, Jemal Gabelia, Soso Sigua, Tsiala Gloveli, Maia Kipiani, Manana Darchashvili, Nino Kholuashvili, Tamar Bliadze, Nana Rosepashvili, Natia Ivanashvili	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual was published, which was reflected in the study syllabus. Research on the interdisciplinary field of cultural law is presented.
13	Education Law, Law	2018	Archil Prangishvili, Irakli Gabisonia	Ivane Jagodnishvili, Ketevan Kokrashvili, Ketevan Jincharadze, Tamar Tsereteli, Jemal Gabelia	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual was published, which was reflected in the study syllabus. Research on interdisciplinary field of education law is presented.

14	Politcs on the court, Interdisciplinary	2018	Henri Kuprashvili Irakli Gabisonia	Nino Odishelidze, Gogi Gachechiladze, Bakur Gulua, Gvantsa Tsakhnakia	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a simulated process was conducted regarding the policies implemented by kings of different eras, high political officials and public figures.
15	The Legal State as a Social and Moral State, Law	2018	Irakli Gabisonia	Mamuka Beriashvili, Jemal Gabelia, Natia Ivanashvili, Nino Nishnianidze, Elene Chaladze, Archil Loria, Alexander Taliashvili, Salome Khizanishvili	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a collection of works was published, which was reflected in the study syllabus.
16	State and Legal Theory Creation, Law	2018	Ioseb Bachiashvili	Ketevan Jincharadze, Elene Chaladze	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual was published, which was reflected in the study syllabus.
17	International Public Law, Law	2018	Mariam Jikia	Ketevan Guguchia, Giorgi Goradze, Khatuna Chkhikvishvili, Dali Meskhishvili, Paata Javakhishvili, Ketevan Jincharadze	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual was published, which was reflected in the study syllabus.
18	Actual Problems of Evidence (gathering evidence, verification and evaluation of pleadings), Law	2018	Irakli Gabisonia	Jemal Ghakhokidze, Jemal Janashia, Jemal Gabelia, Tea Shakulashvili, Levan Kobulashvili, Elene Chaladze,	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, two

				Temur Darsania, Shota Rizhamadze, Irakli Minashvili	manuals were published, which were reflected in the study syllabus.
19	A Peaceful Economy for Conflict Resolution, International Relations	2018	Jemal Ghakhokidze	Irakli Gabisonia, Jemal Gabelia, Sophio Midelashvili, Lili Kharchilava	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual was published, which was reflected in the study syllabus.
20	Post-conflict State Organization and Management of Bosnia and Herzegovina and its Application Prospects in Georgia, International Relations	2018	Jemal Ghakhokidze	Sophio Midelashvili, Nona Lomidze, Giorgi Kalandadze, Tamar Kupreishvili	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual was published, which was reflected in the study syllabus.
21	The Private Part of Criminal Law, Crimes against People and Humanity, Law	2018	Irakli Gabisonia	Jemal Gabelia, Temur Darsania, Tamar Baramia, Elene Chaladze, Rati Gabisonia	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, two manuals were published, which were reflected in the study syllabus.
22	Medical Law, Interdisciplinary	2018	Irakli Gabisonia, Archil Prangishvili,	Tea Shakulashvili, Koba Chikhladze, Tsiala Gloveli, Mzia Dundua	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual was published, which was reflected in the study syllabus. Research on the interdisciplinary field of medical law is presented.
23	Textbook of Victimology, Law	2019	Mikheil Gabunia		The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual

					was published, which was reflected in the study syllabus.
24	Georgian Mentality Dictionary, Interdisciplinary	2019	Irakli Gabisonia	Jemal Gabelia, Ivane Jagodnishvili, Temur Jagodnishvili, Tamar Baramia	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual was published, which was reflected in the study syllabus. A study on the Georgian mentality of the interdisciplinary field is presented.
25	Introduction to Jurisprudence, Law	2019	Irakli Gabisonia	Shota Papiashvili, Jemal Gabelia, Tsiala Gloveli, Vakhtang Zhvania	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual was published, which was reflected in the study syllabus.
26	Sports Law, Interdisciplinary	2019	Irakli Gabisonia	Giorgi Goradze, Tsiala Gloveli, Teimuraz Bezhoshvili, Lali Janukashvili, Lasha Gorgadze, Marina Amashukeli	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual was published, which was reflected in the study syllabus. Research on the interdisciplinary field of sports law is presented.
27	Creation of the European Union and Georgian Political Emigration, International Relations	2019	VazhaShubitidze	Edisher Japaridze, Igor Kveselava, Ketevan Jincharadze, Murman Tavdishvili, Ana Futkaradze, Salome Pipia	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual was published, which was reflected in the study syllabus.

28	"Legal Aspects of Using Blockchain Technologies in E-Government" – was modified to "Development of E-Government and Digital Democracy in Georgia", Interdisciplinary	2019	Archil Frangishvili, Irakli Gabisonia	Zviad Gabisonia, Keti Tskhadadze, Ketevan Tsomaia, Ketevan Marshava	The project was financed from the budget of the Faculty of Law and International Relations.
29	Public Diplomacy in the Post-Soviet Period, International Relations	2019	Avtandil Songulashvili	Ketevan Jincharadze, Maya Kipiani, Manana Darchashvili, Vakhtang Songulashvili	The project was financed from the budget of the Faculty of Law and International Relations.
30	Tax and Budget Law,Law	2019	Irakli Gabisonia	Jemal Gabelia, Malkhaz Chitaia, Alexander Chkhitauri, Tamar Baramia, Ilona Todua	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual was published, which was reflected in the study syllabus.
31	Drug Law, Law	2019	Jemal Janashia	Jemal Gabelia, Khatia Vasadze, Maia Gamsakhurdia, Anastasia Garsevanishvili	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual was published, which was reflected in the study syllabus.
32	Classical Theories of International Relations,International relations	2019	Zurab Kvetenadze	Igor Kveselava, Lili Kharchilava, Maia Kipiani, Salome Pipia	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual was published, which was reflected in the study syllabus.
33	Forensic Techniques in Theory and Practice,Criminology	2019	Malkhaz Chitaia	Ketevan Gogashvili, Natela Mdzelauri, Davit Gvelesiani, Tamila Shoshitashvili	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, students

					were given practical master classes in forensic techniques at the National Bureau of the Expert named after Levan Samkharauli.
34	Russia-Georgia War of August 2008 and International Space, International Relations	2019	Igor Kveselava	Giorgi Gachechiladze, Epiphane Gvenetadze, Nona Tsabadze	The project was financed from the budget of the Faculty of Law and International Relations. It was aimed analyse of the Russia-Georgia war of 2008.
35	Political Parties Law, Interdisciplinary	2019	Iarkli Gabisonia	Igor Kveselava, Jemal Gabelia, Mariam Jikia, Manana Darchashvili, Giorgi Kalandadze, Tsiala Gloveli, Ana Futkaradze, Vakhtang Zhvania	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a guide is being prepared, which will present research on political parties and political systems.
36	Foreign Countries' Diplomacy, International Relations	2019	Eka Bukhrashvili	Maia Kipiani, Lali Kapanadze	The project was financed from the budget of the Faculty of Law and International Relations. Aimed at the diplomacy of foreign countries
37	Political Radicalism in Europe and Georgia, International Relations	2019	Ketevan Jijeishvili	Giorgi Chkhikvishvili	The project was financed from the budget of the Faculty of Law and International Relations. Aimed at researching political radicalism in Europe.
38	Political-legal Assessment of 1991-1993 Events, International Relations	2019	Igor Kveselava	Nino Nishnianidze, Manana Darchashvili, Lali Kakashvili	The project was financed from the budget of the Faculty of Law and International Relations. It was aimed at 1991-1993. political-legal assessment of events.
39	Legal Status of Artificial Intelligence in Georgia, Interdisciplinary	2019	Irakli Gabisonia	Zviad Gabisonia, Ketevan Kokrashvili	The project was financed from the budget of the Faculty of Law and International Relations. aimed at the legal status of artificial intelligence in Georgia,

40	Tourism Law, Interdisciplinary	2019	Nato Tabutsadze	Ketevan Mchedlishvili-Hedrich, Ketevan Kokrashvili, Maka Tkebuchava	The project was financed from the budget of the Faculty of Law and International Relations. Within the framework of the project, a manual was published, which was reflected in the study syllabus.
41	Law of Modern International Organizations, International Relations	2020	Davit Geperidze	Avtandil Khazalia, Jemal Gabelia, Salome Pipia	The project was financed from the budget of the Faculty of Law and International Relations. It was aimed at researching the law of modern international organizations.

Faculty of Civil Engineering
Completed projects in 2018-2023

Department of Engineering Mechanics and Construction – Technical Expertise

№101

	The name of the completed project, indicating the field of science and scientific direction.	year	Head of the project	project Performers
1.	Criterial conditions of static slope stability. Mathematical modeling, forecasting and protection measures of avalanche-like currents.State scientific grant for fundamental studies. Grant contract№ FR/139/9-151/14. Tbilisi, 2015-2018. http://rustaveli.org.ge	05.05.2015-05.05.2018 წწ.	Tariel Kvitsiani	Spartak Avaliani, Gia Khutsishvili
2.	Complex mineral admixture for concretes, production - validation of applicability by testing in an industrial environment	2023-2025	Tamaz Batsikadze	Levan Baramadze, Razden Shvitaridze, Malkhaz Turdzeladze, Davit Bedukadze

1. **Short annotation:** The criteria of static stability and instability of natural and artificial slope are obtained; The formula to calculate the reserve of shift resistance; Complete formulas and methodology to calculate the parameters of avalanche currents; With the help of differential equations of hydrodynamics the issues of mathematical modeling of dynamic processes of landslides and snow avalanches, caused by loss of stability of slopes are studied. The methods to assess the slope stability, and engineering measures necessary to control and stabilize the slopes are given

2. **Short annotation:** Creation of several tons of work made during piloting of the new, improved T4 technology - the product of the composition containing an experimentally selected ratio of inert, pozzolanic and technogenic components - "CCMAFfC" under production conditions. Countable indicator according to the List of deliverables is LOD No. 27 (Sample).

Civil and Industrial Construction Department №102

	The name of the completed project, indicating the field of science and scientific direction.	year	Head of the project	project Performers
1.	Development and creation of extendable reflector antenna for satellite bases. Joint project - USA, Ukraine, Georgia. "EOS Data Analytics", "Noosphere Ventures", "T.S.Georgia".	2019-2021	E.Medzmariashvili	Sh. Tserodze, M. Sanikidze, K. Chkhikvadze, G. Bedukadze, M. Janikashvili, M. Nikoladze, A. Chafodze, G. Qoridze

Short annotation: A drop-down mechanical structure has been developed that ensures compactness in the folded (transport) state of the reflector, strength during the launch into orbit, guaranteed single opening of the reflector, the required accuracy of the reflecting surface of the mesh reflector, and fixation of the reflector during the entire period of operation of the satellite in orbit.

Department of Hydrotechnics and Civil Engineering №104

	The name of the completed project, indicating the field of science and scientific direction.	year	Head of the project	Project manager Lebi

1.	Theoreticalresearchofvulnerableinfrastructuresecurity riskduringformationofpredictabledisasters(EnvironmentalEngineering - EnvironmentalandGeologicalEngineering)	2017-2020	Givi Gavardashvili	G. Gavardashvili E.Kukhalashvili T. Supatashvili I. Iremashvili K. Bziava G. Natroshvili I. Kuparashvili

1.Short annotation: Withintheframeworkoftheproject, thenationalsecuritystrategyandriskmanagementactionplanhasbeendeveloped, therisksofvulnerableinfrastructurehavebeenassessedtakingintoaccountthethreatscausedbynaturalandanthropogenic (includingterroristacts) disasters. The active cooperation of governmental and non-governmental organizations in managing and realizing risks at a modern level is presented, which will allow us to create an effective, integrated and consistent national risk management platform for the prevention and decontamination of natural and anthropogenic disasters.

2.	AcademicCollaborationfor (Building) CapacityinEnvironmentalStudies (ACCES). (Educationalsciences - includingtrainings, pedagogyanddidactics; Earthandrelatedenvironmentalsciences - hydrology, waterresources)	2016-2020	irma Inashvili	I. Inashvili I. Kruashvili A.Bagration-Davitashvili I.Klimiashvili

2.Short annotation: tocontributetotheimprovementofhighereducationinGeorgia, especiallytakingintoaccountenvironmentalandlabormarketrequirements. Inparticular, withintheframeworkoftheACCESS project, thefollowingactivities wereimplemented: creationofanInnovativeEnvironmentalEngineeringMaster'sProgram, increasingthecompetenciesofacademicstaff, improvingthequalityofteachingandresearchapproaches, strengtheninggenderequalityinthehighereducationsystem, updatingtheexistingAnglophone Master'sProgram "WaterEngineering", achievingnewopinionsandperspectivesin

ordertoshareprofessional, culturalandpersonalknowledge-experiencebetweenUniversityofNaturalResourcesandEarthSciences (BOKU)andGeorgian TechnicalUniversity (GTU).

3.	Heat pumps and prospects for their use in Georgia. Building	2020 წ.	M. Grdzelishvili	O. Giorgobiani A. Kopaliani
3.Short annotation: heat pump or a heat machine is a device used to transfer heat energy from the energy source to the consumer.Contrary to the process of heat transfer from a high-temperature source to a low one, heat is transferred in the heat pump on the contrary, from a low-temperature source to a high one.This effect provides a wide opportunity to use renewable energy in microclimate systems of buildings.Based on the study and analysis of water, air and ground heat pumps, recommendations on their design and arrangement for the climatic conditions of Georgia have been elaborated				
4.	Thermal technical characteristics of houses with low energy demand and their provision. Building.	2020 წ.	M. Grdzelishvili	O. Giorgobiani A. Kopaliani

4.Short annotation: The use of renewable energy in construction and increasing the energy efficiency of buildings require minimizing the thermal loads of buildings, which is in line with the European Union's decision to build zero-energy houses by 2050.The basic thermal technical characteristics of the enclosing constructions, which ensure minimal heat losses and maximum thermal comfort of the buildings in order to ensure the thermal regimes of residential and public buildings in the future, are studied.

5.	,,Investigation of concrete deformation using the method of holographic interferometry". The works have been carried out within the frame of the funds of project SH. Rustaveli FR 18-11671	2018 წ.	Giorgi Dalakishvili	Giorgi dalakishvili, Konstantine Khazalia, Giorgi Turmanidze, Otar Sajaia, Tsotne Giorgadze.

5.Short annotation: In this work, the goal is to study the nature of the development of shrinkage deformations and determine the role of individual factors in the development of these deformations. The goal was also to study the process of occurrence and development of shrinkage cracks and the influence of the type of cement on this process. Taking into account the above, in the study of the deformed state of cement stone, it was decided to use the method of holographic interferometry, depriving the indicated insufficiency - the need to include an optically sensitive material in the physical model under study.

6.	Flow regulation elastic barrage Natural sciences, scientific direction: 2.1.5 Earth and related environmental sciencesGr. # AR-18-1244	2018–2023 წწ. 2018–2023 WW.	Eduard Kukhalashvili	Otar Natishvili (coordinator), Inga Iremashvili, Shorena Kupreishvili, Nana Beraya, Khatuna Kiknadze (main performers) Support Staff: Tamriko Supatashvili Nino Nibladze

6.Short annotation: Mudflow prevention buildings and their functions are complex, they include and overlook ecological balance, Landschaft infrastructure, the safety of populated areas, etc. For a country that is mountainous and limited in landmass, in terms of economy, mudslide preventing infrastructure, their condition and reliability are critical. According to the latest history of usage, most of them are outdated or almost non-existent, which is why the level of effectiveness of environment protection measures is low. According to statistics, there are many cases of ecological imbalance, which leads to unfavorable economic and social problems in populated areas. Therefore, in order to regulate the floods and place regulatory

measures in the pipelines and to specify the parameters of the project, clarification of regularities (laws) of change of hydraulic flow parameters are given; Methodology of conducting experiments to describe the diversity of mudflow and the possibilities of impact on buildings and to obtain polynomials for the assessment of impact regularities; In case of regulation with pressure and non-pressure structures, hydraulic functions of connected floods and selection of calculation methodology; Prediction of energy characteristics for safe transit without violation of flood movement regimes and without the generation of obstacles/bottlenecks; Criteria for overflowing obstacles encountered based on a combination of building and flood flow parameters; Taking into account anomalies of mudflows and developing innovative methods of combating them and refining existing constructions; Improving the methodology for calculating the impact of mudflows on buildings; Modeling buildings in a laboratory setting and deriving design parameters of copyrighted buildings.

7.	Assessment of flood and flood hazards Evaluation of the ecological condition of Tetri Aragvi River Natural sciences, scientific direction: 2.1.5 Earth and related environmental sciences	2021–2025 2021	Shorena Kupreishvili	Paata Sichinava - main performer, guest scientist-collaborator; Giorgi Kupatadze - main performer, student; St. Kukhilava – main performer, student;

7.Short annotation: The project discusses the physical environment of the Aragvi river basin, negative factors affecting it, landslide-prone and erosive development areas. The field expeditionary research conducted in the Aragvi River catchment area made it clear that the current ecological condition of the bed in the White Aragvi basins is complex and requires monitoring. The measurements showed that the value of the angle of inclination of the longitudinal profile of the cone of the river discharge. From the confluence it varies within 2-6 degrees, and from the transit area to the headwaters it varies within 7-22 degrees.

8.	Assessment of flood and flood hazards Monitoring of anti-flood structures (Dusheti Municipality) Natural sciences, scientific direction: 2.1.5 Earth and related environmental sciences	2021–2025 2022 წ.	Shorena Kupreishvili Konstantine Bziava	Paata Sichinava - main performer, invited scientist - collaborator; Demetri Janjashvili - main performer, PhD student. Gega Jeranashvili - main performer, student; Giorgi Kupatadze - main performer, student; Giorgi Abesadze - main performer, student; Giorgi Kvirikashvili - main performer, student.

8.Short annotation: Floods are considered natural phenomena, although they can be caused by human activity or other causes. Hazard assessment involves determining their scale and reproducibility and includes their spatial description. The project substantiates the existence of atmospheric factors causing threats; location and dimensions of the affected area; the period of time between the start and end of the event; Also, the time of the event in a certain period (usually a century) implies the extent of the danger (peak flow of the river, area of the surface damaged by the landslide); A primary hazard may lead to secondary hazards, which in turn lead to much more accidents and losses. An example of this is a landslide, which can block a riverbed and cause catastrophic flooding. Long-term floods can lead to the limitation of drinking water supply or possible diseases resulting from its contamination.

Building Computer Design Department №106

	The name of the completed project, indicating the field of science and scientific direction	Date	Project manager	Project performers
1.	Application of probabilistic methods in discrete optimization and scheduling problems DI-18-1429	2018-2021	N. Vakhania	B. Mamporia **Z. Sanikidze** V. Berikashvili A. Chakhvadze **M. Kublashvili** M. Pkhovelishvili

Short annotation: In accordance with the tasks determined by the schedule of the reporting year of the project, practically important cases from the theory of schedules are considered, when under certain conditions the delivery of orders is carried out in continuous batches. To minimize the total value of deliveries and corresponding delays, including in the online scenario, new structural-algorithmic schemes of the mentioned process are proposed, on the basis of which optimal algorithms faster than the existing ones are built to solve the given task.

Within the framework of the grant topic, results have been obtained, which concern the possibility of using certain types of probabilistic distributions in such scheduling tasks, where the processor's execution times are random values. The issues related to the mathematical processing of the process of efficient distribution of tasks on processors in the case of different times are studied.

Work continued on finding probabilistic analogs of the set of optimal solutions for various scheduling problems. The obtained results show the possibility of selecting the best schedules under the conditions of determining the set and number of optimal solutions of the corresponding task.

Construction and Transportation and Mechanical Engineering Faculty Road Department №105

	The name of the completed project, indicating the field of science and scientific direction.	Year	project leader	Project performers
1.	Prediction and prevention of debris flow catastrophic im pacts on Hydraulic projects in mountain areas. Hydraulics and Engineer- ing Hydrology; Mathem atical Modeling and System Identification ;Environmental Technologies	2015-2019	G. Jinjikhashvili	Kh.Iremashvili G.Berdzenashvili T.Stefania G.Aronia
2.	The third project of internal state and local roads (SLRP III) (P148048)	2021	Adolfo Janutz	T. Mekanarishvili P. Nadirashvili

1.Short annotation: The results of mathematical modeling will allow us to quickly describe the complete process of extreme wave movement in the reservoir (wave generation, transformation-dispersion, reflection from the dam, superposition, etc.) as a result of computer calculations. The degree of their impact on the environment will be determined. These methods have an advantage over other methods, as they take into account a number of factors that characterize both hydrodynamic and flood processes. Modern computing technologies are used in the project, in accordance with the set goals. In particular, it was implemented: solving boundary problems of non-stationary, impulse wave motion based on analytical and numerical methods. The new results of the project have significant potential for their practical application, in particular at the stage of planning, co nstruction and operation of reservoirs and dams in mountainous, seismically active areas, as well as during monitoring of reservoirs, for predicting the impact of d estructive waves on the surrounding environment. The use of the above-mentioned methods is also promising in other fields of hydrotechnical construction, in particular, in the case of testing and constructing new types of effectively functioning structures protecting sea and river banks.

2.Short annotation: Anotations: Design and Build of Bakurtsikhe-Gurjaani Road Section Bypass Improvement/ Construction under Output and Performance based Contracting (OPRC)

Construction Machinery Department №108

	The name of the completed project, indicating the field of science and scientific direction.	Year	project leader	Project performers
1	**Lightened inter-floor roofs in monolithic reinforced concrete high-rise buildings using composite cobiax systems; direction:** 2. Engineering and technologies, sub-direction: 2.1 civil engineering, category: 2.1.1 civil engineering; Project identification code: PHDF 22-2256	2022-23 6 month	Tamaz Khmelidze	St. Jerenashvili
2	**Creation of a spacedefensesystem in Georgiabyimproving thetactical and technical parameters of thesatellite complex; direction:** 2. Engineering	2022-23	Elguja Medzmariashvili Tamaz Khmelidze	Revaz Sakhvadze

	and technologies, sub-direction: 2.1 civil engineering, category: 2.1.2. Architectural engineering; Project identification code: PHDF 22-1064			
3	**Investigation of Tensile Deformation Condition of Georgian Basalt Plastic Reinforcement with Concrete; direction:** 2. Engineering and technologies, sub-direction: 2.1 civil engineering, category: 2.1.1 civil engineering; Project identification code: PHDF-22-852	2022	Gela Kipiani Tamaz Khmelidze	Vladimer Kikadze
4	**Calculation of bending of spatial structures with rectangular ridges by optimization Methods; direction:** 2. Engineering and technologies, sub-direction: 2.1 civil engineering, category: 2.1.1 civil engineering; Project identification code: PHDF 21-3812	2021-23	Gela Kipiani	Vasil Beruashvili
5	**Stress analysis of thin-wall layer spatial constructions with holes using finite element methods; direction:** 2. Engineering and technologies, sub-direction: 2.1 civil engineering, category: 2.1.1 civil engineering; Project identification code: PHDF 21-1399.	2021-23	Gela Kipiani	Ioseb Giorgobiani
6				

7	**Mathematical model and algorithm of elastic-plastic state of seismic thin-walled spatial systems with rectangular section; direction:** 2. Engineering and technologies, sub-direction: 2.1 civil engineering, category: 2.1.1 civil engineering; Project identification code: PHDF-21-2432	2020-22	Gela Kipiani	Vazha Sulashvili
8	**Monitoring of rivers/watercourses flowing through settlements and Flowing into the sea and development of recommendations for the Adjara region; direction:.**2. Engineering and technologies, sub-direction: 2.1 civil engineering, category: 2.1.1 civil engineering; Project identification code: PHDF-22-2127	2022-24	Gela Kipiani	Guram Darchidze
	Calculation of stability of reinforced concrete structures with irregularity during seismic impact; direction:.2. Engineering and technologies, sub-direction: 2.1 civil engineering, category: 2.1.1 civil engineering; Project identification code: PHDF-22-2724	2022-23	Gela Kipiani	Zaza Jangidze

1.Short annotation: It is possible to reduce the mass of a high-rise building by using light materials in self-

Supporting walls and partitions, by reducing the cross-section of reinforced concrete load-bearing structures through high-grade (B60-B80) concrete, by using rigid reinforcement, by introducing void-forming joints in monolithic reinforced concrete roofs between floors (bubble deck, Cobiax systems, etc.), Also in roofing with inserts of blocks of light material (perlite, foam plastic, foam polyurethane, polystyrene foam, fichaplast, peat, pumice) etc.

2. **Short annotation:** This topic includes improving the technical parameters of the artificial satellite introduced in the satellite complex. A satellite is an object that is intentionally placed into
orbit. Following dissertation includes the study and design of the structural nodes of artificial satellites.

3. **Short annotation:** Discussed ossues of construction tendency of construction composite composite materials, including the creation, introduction and development of basaltplastic reinforcement, urgency of their use in construction, modern condition and perspectives.The main focus is on discussing the constructions required for construction, as well as on deepening theoretical knowledge.

4. **Short annotation:** thin-walled spatial structures are widely used in the form of, tiles and shells in construction. Increasing their efficiency is related to the refinement of new reporting schemes and calculation methods. It is known that the study of each construction is based on certain simplifications which relate to both the displacements and the deformation magnitudes.

5. **Short annotation:** Nowadays plate and shell multilayer thin wall structures are used in most fields of engineering. The use of these types of structures in civil engineering is due to the demand for mechanical and physical properties like maximum strength and minimal weight. In some cases, this is due to the acoustic, thermal, and vibration isolation requirements.

6. **Short annotation:** The problem of calculating discontinuous thin-walled structures in elastoplastic conditions is rather complicated, relevant and requires the development of special calculation methods.
The aim of the investigation was to study the elastoplastic state of an anisotropic body with a wound. Creation of a methodology for calculating thin-walled structures that provides an accurate display of the elastoplastic state at any stage of loading with minimal calculation.

7. **Short annotation:** An assessment of the hydro resources of the region was carried out. Determination of discharge, turbidity and lactose-positive pollution in selected rivers. It is worth noting that a study of 300 large and small rivers in the Adjara region was carried out. After observing the studied rivers, those rivers were selected whose laboratory studies are needed to continue the research. The legislation related to the water sources and its sanitary norms in force in Georgia was studied, and the search for available information about the rivers flowing in the Adjara region was carried out to process the data obtained as a result of the planned laboratory studies.

8. **Short annotation:** The concept of restoration-reconstruction and strengthening reconstruction for large-block multi-storey buildings will be developed for the group to be strengthened relatively among mass-series groups (types) of capital buildings. Three methods of restoration-reconstruction of damaged large-block multi-story buildings are proposed: in the inner space of the building, metal indirect and system-variable rigid, in today's terminology-seismic isolators, with the arrangement of additional frames; with iron-concrete pylons built on the entire height and perimeter of the building and arranging loggias in their space; By building pylons along the longitudinal facades of the building and building a floor/floors on top of the building, along with arranging additional frames with seismic insulators if necessary.

ენერგეტიკის ფაკულტეტი

№	The name of the completed project, indicating the field of science and scientific direction	Year	Program Coordinator	Project performer
1	"Construction and Investigation of Integer Gaussian Convolutional Codes, Generalized Cascade Codes and Spatiotemporal Codes and Their Synthesis with Continuous Phase Modulation"	2015-2018	Shavgulidze Sergo	Albert Asanidze

Project title	Years of project start and end	Personnel involved in the project
"Research on the potential of natural and human (labour) resources of Georgia and sectoral	(2022-2023 წ.წ)	• Head of the community - chief scientific employee,

and regional problems of its rational use". Energy. energy efficiency.		• Tech. Doctor, N. Mirianashvili; • • Responsible executor - chief scientific employee, • Tech. Doctor, Professor K. Vezirishvili-Nozadze
It is a key field of not only economic, ecological and/or climatic, but also political challenges and risks of modernity. In the conditions of global climate changes, the energy sector is given special attention. Increasing use of solar, wind, hydro, geothermal, and biomass will help reduce greenhouse gas emissions and shift the fossil fuel-dependent economy to cleaner sources. The EU's goals - to replace traditional energy with renewables - are becoming more ambitious every time. The Global Green Deal, which should be the basis of the EU's economic vision, provides an additional incentive for this. The paper contains an energy-economic analysis of the energy sector of Georgia; The target indicators and characteristics of the energy sector are discussed; The most important tasks of energy security, energy saving and raising the level of energy efficiency have been established; Ways and directions to solve these problems are set. Georgia should try and get involved in common radical, revolutionary changes, which is called "4th energy transition". This transition will reduce the use of fossil fuels to a minimum in the next 10 years, and in 2050 the whole world is declared to be "carbon neutral" energy. The use of solar and wind energy requires reserve capacities, the cheapest source of which is hydropower. The paper substantiates and analyzes the most important issues of the need to utilize hydro resources, and recommendations based on research are given. We believe that in order to deepen the political and economic relations with the European Union, it is important to gradually bring Georgia's legislation closer to the European one, which will contribute to the establishment of a specific, transparent and effective energy market model, the creation of an attractive and stable investment environment, the development of trade in energy resources between Georgia and the EU countries, economically and ecologically justified. through utilization of renewable energy resources and implementation of measures focused on energy efficiency. The European Green Deal is a long-term path to transition to a low-carbon economy, in line with the terms of the Paris Agreement. It envisions Europe as the first carbon-neutral continent by 2050. To achieve this goal, the European Union plans to reduce emissions by 50% by 2030 compared to 1990. Naturally, this can only be achieved by adopting and implementing relevant strategic documents and decisions. Accordingly, the paper discusses the main essence of the Green Agreement, the challenges related to its implementation and its impact on the future of the Eastern Partnership, especially on Georgia. In our opinion, one of the strategic goals of the new energy policy should be: Northern line and Namakhvani (connection of power plants from Svaneti and Racha regions to the transmission network). Guria and Kakheti (connection of hydroelectric plants from these regions to the transmission network). Georgia, as a party to the energy union, plans to implement and share the provisions of the EU directives, according to the work program. That is why the presentation of the National Renewable Energy Action Plan (NREAP)		

is on the agenda. The main issues to be resolved are: improvement of the investment climate; Establishing a tight and liberal market; Phase-out of the European technical regulation, the system of opaque memos; Eliminating opportunities for corruption. In order to achieve these results, in our opinion, it is necessary to carry out the following measures: studying the potential of the country's alternative energy sources, preparing recommendations for their preferential utilization and promoting their implementation; Development and implementation of the National Renewable Energy Action Plan (NREAP); implementing a new energy policy; Preparation of recommendations on efficient functioning of the energy sector (and not only) and increase of energy efficiency; Taking part in various projects funded by international organizations, planning and conducting appropriate procedures for their successful implementation; Regarding renewable energy sources in the draft energy strategy, we make recommendations: 1. Conduct a feasibility study to determine which support scheme is appropriate for different technologies and generation volumes; 2. From the perspective of technological development and the impact on the electricity trade market, the financial impact document on the support schemes should be evaluated and analyzed; 3. Before developing a new strategy, the state program - "Renewable energy 2008" should be adopted and new target indicators should be established.

Project title	Years of project start and end	Personnel involved in the project
Building an ecologically clean, energy-saving enterprise (farm-ranch) and introducing innovative technologies into it. Energy, environmental and building ecology;	2022-2023 წ.წ	Project leader - Prof. David Lolua Consultant - physicist Ioseb Mchedlishvili
The research project envisages the development of equestrian tourism in the Guria region. The project will create comfortable, environmentally attractive living conditions for guests, as well as a seasonal stall for horses. The main theoretical part of the project is the design of energy-saving, ecologically healthy cottages and commercial buildings for people and animals (horses) in the regions of Western Georgia. Construction and realization of the complex taking into account the climatic conditions for summer and winter seasons, choosing the methodology of building walls with organic material, which is based on the use of natural, renewable eco-material (wood, sickle, reeds, clay-soil), calculating the parameters of thermal insulation of the walls, creating recipes for plastering eco-material For places protected from rain. Calculation of construction costs and profitability. The practical results are the implementation of new innovative technologies, which will be shared by the local population, so that they can build ecological, energy-saving, cheap buildings of various purposes with their own hands, without the help of		

specialists, these buildings are a wooden frame (used together with new wood materials, all kinds of secondary wood construction materials), which will be filled with breathable sickle bags for insulation (the volume of one light bag holds eight standard non-ecological heavy blocks of concrete), and then to strengthen the insulation and protect from rain, plaster with clay-soil, the recipes of which we will select and teach. They are also given the opportunity to think about creating a healthy environment for the animals in the summer-winter stall. After improvement, the built stable will give us the opportunity to improve the conditions of horse care and develop equestrian tourism in the region. It should be noted here that there is currently no potable water on the territory we have used. As part of the program, we purchased a device for obtaining potable water from the atmosphere, the output of which is 100 liters per day. This water is also necessary for thoroughbred horses to drink.

1. The theoretical result of the completed research project is the experimental or reporting data and parameters, on the basis of which a new, healthy approach was created for the introduction of easy, cheap, ecologically justified, heat and electricity saving, self-constructed buildings for various purposes in resorts and rural areas. These cognitive studies and theoretical methods will lead to the possibility of introducing innovative, currently forgotten natural building materials. The calculation data will help the residents of the region to plan and build light and quick-to-build cottages for vacationers on the nearest beaches. 2. Prior to the implementation of the project, practical (building walls,) ways and approaches on the given soil and climate conditions, which required certain knowledge, were not known. The value of this research project is the three buildings of the created complex, which were built using different innovative methods. Using the results of the research, we gained experience, which we will practically pass on to everyone.

Project title	Years of project start and end	Personnel involved in the project
"Experimental study of the influence of artificial turbidity on the heat transfer of water flowing on the outer surface of a vertical pipe"; Engineering and technologies - mechanical engineering - thermodynamics;	2020-2023წწ.	Giorgi Gigineishvili - main performer.
As a result of the implementation of the project, the following results were obtained: a) according to the developed scheme, an experimental unit with power supply and experimental measurement systems was manufactured; b) experimental data processing algorithm and corresponding program were created; 2) experimental data of heat transfer coefficients were obtained in cases of heating surfaces with smooth and different types of artificial graining (two-dimensional graining; pincer graining; combined and grooved graining) of the vertical tube; 3) The obtained experimental results were analyzed and generalized and appropriate conclusions were drawn. A monograph was published. The obtained results are reflected in the articles published in local scientific journals and in the proceedings of international conferences. Collections of these works are indexed in the scientific databases of Scopus.		

Project title	Years of project start and end	Personnel involved in the project
"Promoting the use of renewable energy sources and capacity development in the field of environmental protection at the Technical University of Georgia"	2022-2023 წწ	Eutykh Machavariani - the main performer
The project was implemented at the Faculty of Energy of STU and materially on the building of the technical training center of STU. On the roof of the building, a power receiving system with solar photoelectric converters and a solar water heating system were installed. Both systems are included in the electricity and heat supply systems of the STU training center building, which, of course, will bring some profit to STU at the expense of savings on electricity and natural gas consumption. The		

project will also benefit our students and staff with the opportunity to perform high-quality practical and laboratory work and will be an important step in the development of renewable energy and the use of sustainable technologies both in our university and in Georgia as a whole.

Combating climate change is effective through better understanding of its causes, evolution risks, impacts and opportunities. A battery energy storage system, which will be able to supply energy to the customer, will also be able to store energy that comes with a certificate of origin, that is, an electronic document that confirms that the share of electricity supplied to the customer is derived from renewable sources.

Project title	Years of project start and end	Personnel involved in the project
"Sustainable pesticide-free technology based on solar energy for export-oriented bio-organic wine production for Georgian small and medium wine producers". Engineering and Technology	2022-2024	Project leader - Prof. Lena Shatakishvili.

The pilot study is divided into two 12-month periods. During the first period, in January-March, work began with the creation of a solar-powered system and initial ozonation technology. Since the founders of the ozonation company are members of the team, it was possible to prepare the device at the end of March 2023. The system and technology were then implemented and the systems were installed at five locations in the Bolnisi region. Winemakers who are members of the association have given us their vineyards for ozonation and comparative studies. During the summer, ozonated water was sprayed. Research was done on different types of grape varieties, soil and water, and chemical tests were done at the same time. Finally, the wine produced from the study vines will be examined and compared to the wine produced from classic pesticide-sprayed vines. Received will be discussed with implications for technology and systems optimization for the second biennium studies.

Project title	Years of project start and end	Personnel involved in the project
"Promotion of renewable energy sources and capacity building in the field of environmental protection at the Technical University of Georgia". Renewable energy	2022-2024	Manager of the Georgian side of the project - Prof. Lena Shatakishvili.
As a result of the mentioned project, a renewable energy center will be organized in the territory of the analysis facility, which will be equipped with the following systems: a photovoltaic system with a capacity of 20kWp + 5.8kWh battery for its partial storage and a thermal solar system with a capacity of 1000 l of hot water with an indirect heating cycle and a control system that works even at low temperatures. As described in the project proposal. Internal distribution of electricity and hot water. Effective use of the above systems. Auxiliary equipment for measuring the parameters of the solar system. Trainers will be held in this center, which will be conducted by young people trained in Slovakia. After the implementation of the project, at least 50 people will improve with knowledge: in renewable energy sources, which will be able to sustainably use natural resources, protect the environment and implement climate change mitigation measures.		

Project title	Years of project start and end	Personnel involved in the project
Problems of staffing of innovative technologies and their solutions Roads in Georgia: management. Engineering management and marketing.	2022 – 2025	• Assoc. Professor Avtandil Asatiani - research director, Determination of methodical approaches • Ekaterine Mgeladze - PhD student. Research methodology and processing of analytical-evaluative issues; Presentation of research results.

In the modern conditions of economic development, it is becoming more and more difficult for enterprises to occupy a significant place in the market, because the growing influence of globalization has completely changed the image of the world economy, and therefore, the goods and services that were present even a few years ago are no longer valuable for society. Therefore, if companies want to establish their name in the market, they have to keep up with these changes, therefore, today, innovative development has become an integral part of the main activities of enterprises, because it ensures the creation of completely new and improved products and services on the market, increases the efficiency of the firm, and most importantly, increases its profitability. The progress of society is inextricably linked to innovation. Today, innovative changes are the main factor of economic growth. Competitiveness of economic entities is conditioned by innovative activity. The practical use of new ideas, latest products and techniques contributes to the economic growth and social development of the modern society. At the modern stage, the process of introducing innovations in Georgia is ongoing in many areas of the economy. In order to overcome the backwardness of developed countries, it is necessary to develop high technologies and scientific fields. Although a number of measures have been taken for the introduction and development of innovations in the country, we are still far from the desired results. This is confirmed by Georgia's place in the international rankings. One of the main reasons for this is the unpreparedness of personnel for this field. Despite the fact that benefits are established for innovative entrepreneurial structures within the framework of the functioning of venture funds, technoparks and business incubators, their volume is not sufficient for the stable development of an innovative manufacturing company. In this direction, it is necessary to involve higher education institutions in the development of innovations, they will help economic entities and state structures to solve problems through the development of innovations. Solving this issue is quite a difficult task and requires systematic work, which should involve both the state, academic and industrial spheres. It is necessary to create a link between academic and scientific fields. At the modern stage of development, the main strategic resource of companies is its personnel. Implementation of innovations - willingness to serve determines competitiveness and success in business. At the organizational - technical level of the innovative management system of enterprises, a unified conceptual approach is necessary, which can ensure the successful market advancement of new or improved products, at the expense of the key variable of the internal environment of such enterprises - personnel. The analysis reveals that scientific and technical organizations need staffing of internal infrastructures for commercialization of knowledge. Managers with special qualifications are needed, which distinguishes them from scientific managers. Professionally trained personnel in the organization and management of the field of innovative management become the most important asset of industrial enterprises.

Despite the fact that the specific share of innovative enterprises in the economy of Georgia is small, such companies also constantly suffer from a shortage of qualified personnel serving innovations, which hinders the development of the most promising area of the economy. Therefore, it should become a part of the country's higher education policy to fully solve the personnel problems of innovative technologies. Because the development of innovative businesses in the country is an opportunity to become an exporter of scientific products from an importing country. The introduction of innovations in the field of production will not only

increase the quality of manufactured products and reduce costs, but also fundamentally new types of products and services will be created, new key markets will emerge, the competitiveness of economic entities will increase, and the standard of living of the population will rise, thus Georgia will occupy a worthy place among the countries of the European Community.

Project title	Years of project start and end	Personnel involved in the project
Labor market transformation and challenges facing education; managment. Engineering management and marketing.	2021 – 2024	• • Invited professor Konstantine Khmaladze - research management, Determination of methodical approaches • • Natia Gochashvili - PhD student. Research methodology and processing of analytical-evaluative issues; Presentation of research results.
In modern conditions, education and science are considered as the cornerstone of economic and sustainable development of the country. Important reform measures have been carried out in Georgia. Nevertheless, there are still a number of problems and challenges related to the quality of education and training services, adaptation to the labor market, and promotion of science and research development. IV technological revolution (Industry 4.0) involves the development of robotics, further digitalization of the economy, automation of production and service. Information systems, global industrial networks will emerge and develop. This will fundamentally change all areas of the economy and business. Significant transformations are expected in terms of the quality and level of life of all the main components of Industry 4.0 (the Internet of Things, artificial intelligence, machine learning and robotics, big data arrays, additive manufacturing, cyber security, etc.) to create opportunities to raise production efficiency to a new level using digital technologies, Through the establishment of network connections and the realization of innovative business models. It is important that the transformation of the labor market will be carried out in the direction of reducing jobs. Currently, we can predict the following main changes expected in the labor market: an increase in unemployment, especially among young people (20-30 years). Already, this trend is observed not only in our country, but also in the entire region and the EU area; reduction of		

the scale of labor migration due to restrictions on transportation; Strengthening of the sectoral imbalance of employment, which is reflected in the level of wages. in dynamics. As a result of the pandemic, inequality in labor income has been highlighted in many countries. Along with this, the activity of financial markets has been activated under the conditions of liberal monetary and fiscal policy. There is an increase in the population category with high incomes and financial assets. In the conditions of the technological revolution and the pandemic, the problems related to employment will be exacerbated in the conditions of the atrophied structure of the economy and the imbalance between the demand and supply of labor force. According to forecasts, a number of professions will become in high demand, such as: IT-specialists, scientific- and engineering-technical specialties, professions related to mathematical knowledge, etc. In the coming years, following the development of artificial intelligence and robotics, the issues of labor arrangements for low-skilled persons who do not belong to the above-mentioned professions will become more complicated.

Against the background of the current technological revolutionary transformations, special importance is attached to the effective involvement of human capital in the development processes of the country; compliance of education programs with the current and future requirements of the labor market; training of professional personnel; Union of higher education, science and innovative technologies. Implementation of integrated programs in the general education system. On the basis of students of the final grades (9th and higher grades), at the same time, the formation of professional training groups according to the required professions. Vocational education focus on the training of technical specialists defined by Industry 4.0 in such areas as: IT programs; labor safety; transport and logistics; sea and rail transport; tourism and gastronomy and others. It is important to introduce opportunities for state-private partnership in the professional education system as much as possible. Formation of a new university model - entrepreneurial universities. Following the growth of scientific entrepreneurship opportunities, the production demand for effective technologies can be met by technology transfer offices, incubators and research groups of various profiles operating in relevant universities. It is important to establish entrepreneurial universities in the regions. The connection between education/science and business will be shown as an important factor contributing to the development of the regional (local) economy. Higher education institutions can play a leading role in the development of the economy of the respective region. An entrepreneurial university systematically affects the innovative development of the economy. Patented inventions at this university improve the start-up of new businesses and/or the functioning of existing businesses. A regional entrepreneurial university should combine the efforts of education (all levels), scientific-research field and local government in order to effectively use the intellectual potential of the region and population. It should be noted that certain steps have been taken in the direction of the implementation of the new university model. Tbilisi, st. Batumi and St. in Kutaisi. We have in mind the creation of a material and technical base for the purpose of forming them into "cities of knowledge".regarding ongoing processes. Similar actions should be extended to other regional centers. First of all, the intellectual potential of the regional administrative units (parties) should be

studied, the directions of development of economic activity and the sectoral structure should be determined, the current and prospective parameters of the demand for professional personnel should be studied, educational programs should be developed, training materials and implementation mechanisms should be prepared. The formation of entrepreneurial universities will contribute not only to the improvement of the university system, in which the introduction of new approaches to teaching, more independent work of students, their involvement in research and the development of new required skills will be ensured, but it will also improve the quality of scientific research and teaching in general education schools. By fulfilling this function, it appears as a kind of cornerstone of the education system, which should assume the function of the main driving force (this is also confirmed by studies of the entrepreneurial ecosystem conducted abroad). Facilitating the formation of entrepreneurial universities in the regions of Georgia, in addition to the above, will contribute to the increase of local scientific staff and the reduction of the outflow of intelligence, the stabilization of the population in the region, the reduction of unemployment and the increase of incomes, the reduction of barriers when starting a new business, a systematic approach to the development of the economy, the profitability of scientific research and other synergistic features characteristic of the system. processes.

The formation of an entrepreneurial university model in Georgia will best respond to the performance of the governmental green economy and educational and economic hub function in Georgia.

Project title	Years of project start and end	Personnel involved in the project
Information security of the public administration system. managment. Engineering management and marketing.	2020 – 2023	• Invited professor Konstantine Khmaladze - research management, Determination of methodical approaches • Akaki Shekeladze - PhD student. Research methodology and processing of analytical-evaluative issues; Presentation of research results.

In the wake of the development of technology, both the frequency and severity of cyber-attacks are increasing more and more among the threats to the security of countries. In the work, the reader will get acquainted with the main challenges in the cyberspace, which today create a basis for alarm in the context of national security. The article reviews the importance of cyber security for the state, types of cyber attacks, known cyber attacks against countries, including Georgia. Based on their analysis, threat mitigation measures are also proposed based on relevant foreign experience, research and statistics. Attacks are carried out using various tools and technical means, such as: social engineering, phishing, DoS and DDoS attacks, malicious programs, Ransomware, Spyware as well as Zero-day exploits, etc. In the wake of technology development, hackers need to strengthen their own capabilities, which includes the development of their human resources, as well as the refinement of tactics, the strengthening of software tools, in order to successfully achieve their malicious goals. This paper discusses the most powerful and well-known cyber attacks against the state, including the cases directed at Georgia. The conversation concerns the software tools and technical potential that form the basis of the alarm, as of today, in the modern cyberspace and which are currently the biggest risk for the information security system of the public administration of Georgia. Implications not only for information systems but also for physical infrastructure will be discussed. As a result of the analysis, we will present possible researched and proposed innovative means of preventing the mentioned threats, and we will outline the next stages of the research in order to evaluate their practicality, applicability, possibility of implementation and efficiency. Thus, the examples discussed in the paper showed us the importance of cyber security as a cornerstone of national security and presented various noteworthy examples of its breach by malicious actors.

Project title	Years of project start and end	Personnel involved in the project
The coronavirus pandemic and the issues of transforming Georgia's foreign economic policy. managment. Engineering management and marketing.	2021 – 2024	• • Invited professor Konstantine Khmaladze - research management, Determination of methodical approaches • • Nino Ramazashvili - PhD student. Research methodology and

		processing of analytical-evaluative issues; Presentation of research results.
The coronavirus has also had a significant impact on the world economy. According to preliminary estimates of the Organization for Economic Cooperation and Development (OECD), due to the spread of the coronavirus, China's economic growth will decrease to 4.9%, the Eurozone's to 0.8%, and the USA's to 1.9%. According to the estimates of the International Labor Organization, due to the virus, the number of unemployed in the world, from the existing 188 million, will increase by 5.3 - 24.7 million. It depends on how widespread the spread of the virus will be. According to the estimates of the World Tourism Organization, in 2020 international tourist arrivals will decrease by 1-3%. In the manufacturing sector, sub-sectors such as automobile manufacturing and electrical equipment manufacturing suffered particularly badly. Share prices on stock markets also fell significantly, and financial markets saw particularly heavy losses. The demand for non-primary consumption items has significantly decreased. Due to social distancing, the demand for entertainment services such as visits to cinemas, cafes and restaurants and sports events has dropped to almost zero. The paper emphasizes that three important steps should be taken to avoid severe economic consequences: first, it should be possible to prevent people from going hungry and increase social packages or introduce unemployment compensation; On the other hand, it is important to understand what type of economy we have and start developing plans for structural change, be it employment of the army of unemployed in agriculture and utilization of their labor resources, as well as thinking about people who work abroad. There is also a need for an industrial development plan and mobilization of financial resources for those companies that will be focused on the emergence of local production. The third step should be the development of an orderly political vision and approach, so that the country's positions are not compromised either with international actors and the International Monetary Fund, or with local business corporations.		

Project title	Years of project start and end	Personnel involved in the project
The importance of regional hubs in reducing disruption in global supply chains. managment. Engineering management and marketing.	2020 – 2022	• Professor Archil Samadashvili - research director, Determination of methodical approaches • Nino Kvaraya - PhD student. Research methodology and processing of analytical-evaluative issues; Presentation of research results.

Global supply chains have always been vulnerable to risks associated with unpredictable and long-term events such as natural disasters, trade wars, pandemics, political instability, etc. The delays are largely due to the lockdown measures that countries have adopted and implemented globally as a strategy to combat the spread of the pandemic. Suspension of production, restriction of movement of people and goods, closure of borders, logistics restrictions, as well as slowdown of trade and business activities are the result of the lockdown measures of COVID-19. It is important to analyze the issues, challenges and implications of the impact of the COVID-19 pandemic on supply chain operations globally. as well as strategies and insights into opportunities to mitigate the risk of supply chain disruptions caused by pandemic impacts. Supply chain resilience and smooth operations are critical to economic recovery, and to effectively mitigate the impact of COVID-19, companies must implement innovative measures across the value chain. Understanding how global manufacturers deal with disruptions in their supply chains will help all businesses structure their responses. For many companies, it has been difficult to determine how far their supply chain disruption has progressed. The paper concludes that we can no longer rely on past data to predict the future. Among the practices that need to be reviewed is the use of historical data to make decisions. Demand forecasting allows companies to manage supply chains in real time. Using such integrated capabilities, businesses can analyze real-time supply and demand scenarios to better plan and optimize their supply chains [7]. Through automation, organizations can collect and analyze data in real time to provide the hyper-localized visibility needed for manufacturing and distribution as they expand or contract. Many businesses will focus on analyzing changes in supply and demand and mitigating risks, as well as figuring out how to return employees to safe and productive working conditions. Georgia, along with Turkey and Azerbaijan, are reliable transit partners in the region, and the joint transport corridor provides an opportunity to access reliable

distribution channels and global markets. This provides an opportunity to replace global supply chains with local ones. The function of the local hub is quite real for Georgia to assume.

Project title	Years of project start and end	Personnel involved in the project
"Ten-year plan for the development of the transmission network of Georgia". Electric power	From 2014 to now, every year	• The author of the ten-year plan - Prof. A. Kokhtashvili; • Responsible performers: G. Erikashvili, G. Bardadze, G. Vakhtangadze, G. Ghdgomelashvili, N. Kiladze, N. Gabeshia
Theoretical results: This is a ten-year plan for the development of the electric energy system of Georgia, the goal of which is system security (meeting the N-1 criterion), reliable connection of consumers and generation sources to the grid, utilization of transit potential. The ten-year plan is based on "Network Rules" and the Law of Georgia "On Electricity and Water Supply". The initial information of the ten-year transmission network development plan is future generation sources, future consumption centers, inter-system infrastructure. Taking this into account, such technical calculations are carried out, the so-called "Stress Tests" of Network Development Alternatives. These tests are flow distribution - to check the capacity of the network in normal mode, stability analysis - the ability to continue sustainable operation of the system in case of loss of elements and maintain system parameters within acceptable limits, short-circuit current analysis - to indicate to existing system participants and investors what short-circuit currents to expect for development periods and potential To identify amplifications, harmonic analysis - to what extent are harmonics caused by DC converters, cost-benefit analysis - to prioritize projects based on technical feasibility and economic benefit. Practical result: the ten-year plan is annually agreed by the government and approved by the Ministry of Economy and Sustainable Development. According to this plan, the transmission network is developed and the need for new generation sources is identified. In addition, according to this plan, the investment plans of the state electricity system of Georgia as a transmission system operator are drawn up and tariffs are approved.		

Project title	Years of project start and end	Personnel involved in the project

Generation Adequacy Report, Electric Power	From 2021 - now, every two years	• Author of the plan - Prof. A. Kokhtashvili;
Theoretical results: 15 years of development of the system is developed according to the "Supply Security Rules". The development of the scenarios of this plan and the planning of such generation facilities in these scenarios are carried out, which ensure the coverage of consumption at all stages of development, without the minimum shortage of unsupplied electricity and reserves. Practical result: the Ministry of Economy and Sustainable Development agrees with the medium and long-term adequacy plan. It is a document that allows decisions to be made for the optimal development of generation (hydro, wind, solar, thermal) under different consumption development scenarios.		

№	The name of the completed project, indicating the field of science and scientific direction	year	Head of the project	Project manager Lebi
1	GRANT # N PHDF-18-494 OF SHOTA RUSTAVELI NATIONAL SCIENCE FOUNDATION DOCTORAL EDUCATIONAL PROGRAMS - "BLOCKCHAIN-BASED BIOMETRIC ELECTION SYSTEM"	2018-2020	Prof. A.Prangishvili Prof. L.Imnaishvili	PhD student Ketevan Tsomaia
The aim of the research was to improve electoral systems. Within the project the analysis of traditional and electronic electoral systems, as well as biometric electoral systems was conducted; critical analysis has been made to address the advantages and disadvantages of electoral systems; the dynamics of the development of existing electoral systems were studied. In order to improve the existing electoral systems, a new electoral system has been developed, that ensures reliable, credible and fraud-free elections. The study revealed two main issues: voter identification and need of reliable storage for sensitive data. Biometrics was used for guaranteed identification and sensitive data was stored in a blockchain for reliability. Accordingly, the architecture , protocols, algorithms and physical model of blockchain based biometric election system were developed. The physical model of developed electoral system was tested in an experiment. The experiment was conducted at the Georgian Technical University on December 12, 2020. About 100 participants took part in the experiment, which was the simulation of elections. All of the participants were able to vote without complications. It should be noted, that				

voting was possible in two different ways, One was at the polling station and the other option was remotely. For remote voting, voters just needed to equip their computers with appropriate software and hardware systems. It should also be noted, that voters had an opportunity to check (verify) their votes in elections. The experiment was successfully completed, demonstrating the effectiveness and reliability of the developed block-chain based biometric election system. The blockchain-based biometric electoral system, developed during the study, minimizes the possibility of election fraud, and if implemented, will change the public's approach to the election - voters, knowing that the election results will not be falsified, their participation into the elections will increase. The proposed and developed blockchain-based biometric electoral system can be used to build electronic systems for conducting various levels of electoral processes, not only on the scale of the country, but also for local elections (for example, by-elections), for municipal elections, for local elections of the organization (for example, across the Student Self-Government Election University), for closed voting, for open voting. Therefore, the area of wide use of the developed electoral system is obvious.				
2	Shota Rustaveli National Science Foundation. New challenges of cyber security in the global information space.	2018-2019	Prof. N.Arabuli	Prof. N.Arabuli
The project "New challenges of cyber security in the global information space" is a seasonal school. At the training events conducted by Georgian and foreign specialists working in the field of information security, the trainees had the opportunity to create a complete understanding of the threats in the modern digital information space, both globally and throughout our country. Fifteen young scientists interested in the field of cyber security participated in the project. They raised their qualifications on the research methods of the mentioned field, developed skills of transferable interdisciplinary cooperation, and what is also important, with the involvement of foreign lecturers, they were integrated into the international scientific space.				
3	World Bank, Ministry of Education, Science, Culture and Sport of Georgia (MoESCS), National Center for Education Quality Enhancement (NCEQE) and Teacher Professional Development Center (TPDC) - Strengthening Teacher Quality in Vocational Education and Training.	2020-2021	A.Gogatadze	Prof. N.Arabuli

The goal of the project was the development of professional IT programs; Creation of evaluation tools using modern approaches and methodologies in information technology modules and training of IT trainers in the field of professional education (ToT) according to the mentioned methodology.				
4	Open Science Development Promotion Program	2022	Prof.Z.Gasitashvili	As.Prof. Vl.Adamia
Within the framework of the "Open Science" grant, a wide database was developed for the research institutes of the university, which includes a wide database of different categories of scientific workers over the past 20 years, research technologies in the research institutes, and others, on which both relevant Excel files and a web page were created.				
5	Research on parallel programming algorithms for multidimensional problems	2022-2023	Romeo Galdava	Prof. N.Arabuli
The main goal of the project implementation was the research of second-order accuracy parallel type algorithms for multidimensional tasks, determination of their stability, convergence conditions, consideration of the dependence of calculation accuracy on various parameters and further analysis.				
6	**Digital citizenship in school**	2023	Prof.N.Dikhaminjia	Prof.N.Arabuli
The project is implemented in partnership with the STEM Teachers' Association and carries out training/retraining of teachers of general educational institutions in the following subjects: "Digital Security", "Possibilities and threats of artificial intelligence"; "Why media literacy?"; "Cybersecurity Needs, Education and Careers".				
7	ERASMUS+KA2 project "Increasing research capacity of Georgian higher education institutions on higher education research and development (HERD)" (grant agreement No. 598207-EPP-1-2018-1-GE-EPPKA2-CBHE-SP).	2020-2022	Prof. Nino OkribelaSvili	Prof. Z.Tsiramua Prof. Z.Gasitashvili
The project aims to upgrade the research capacity of Georgian universities through developing the R&D units within the target universities. In order to achieve this aim, the following objectives are set: To establish a joint research platform that would facilitate the planning, implementation and evaluation of research activities in the target universities 1. To create an Online Georgian Research Portal that will display the state-of-the art information on the activities, human resources and infrastructure of the academic institutions in Georgia				

2. To upgrade the research management and data analysis skills of university administrative personnel for producing high quality research management, analyzing institutional research data and providing ground for further forecasting and strategic planning To enhance the capacity of the target universities in respect to research transfer and university-industry collaboration				
8	Laboratory for diagnostics and analysis of computer systems	2019	Prof. A.Benashvili	Prof. A.Benashvili
According to the project, a training laboratory was implemented on the basis of the educational and research laboratory of information technologies of the Faculty of lty of infors and Control Systems. The laboratory for diagnostics and analysis of computer systems is equipped with Ultra-X diagnostic kits. The device has an industrial purpose and full-scale laboratory work is carried out on its basis. Students acquire such practical skills that facilitate their further employment in companies producing and servicing computer systems without additional courses and trainings. The laboratory will study generations of processors and their design standards, motherboard chipset and specifications, interfaces, drives, controllers, power supply and power supply issues for computer components. Students will learn how to diagnose a computer and determine the characteristics of its components. As a result of the acquired knowledge, the student will be able to independently assemble, upgrade and debug a computer system, use diagnostic equipment and software, and maintain computers. For the needs of the laboratory, the corresponding educational and methodological literature has been developed.				
9	Introduction of IT professional educational cluster in TVET System of Georgia and development of eLearning Platform for LLL	2019	Prof. Zaza Tsiramua	Associate Professor Vladimir Adamia
Project objectives 1. Establish a unified IT professional education cluster aimed at increasing the level of IT teaching throughout the entire system, including employers and strengthening of business involvement. 2. Training and retraining of IT techers and granting them the status of international certified instructor.				

3. Creating the unified educational e-Learning portal that will host all the study and teaching materials related to these IT TVET programs.				
10	Development of IT-related on-line Training Programs.	2019	Prof. Nani Arabuli	Associate Professor Vladimir Adamia
As a result of the project, an electronic training course of the general module "Information Technologies" was created for college students and teachers, for all professional educational institutions of Georgia. The "Information Technology" module is a compulsory study module for all types of programs and it is taught in all majors of colleges. The presented electronic (distance) course was the first large-scale electronic course introduced in the professional education system of Georgia. The electronic course created as a result of the project was successfully implemented in all interested colleges.				
11	A single integrated web platform for the modeling and management of the urban system			
A single web platform of a "smart city" is understood as a software package that provides users with the means of registering and processing various processes and parameters of city objects using system mathematical and software tools. The web platform includes: website, Google Maps, databases, control panel, user registration and authorization, marking objects on the map, storing objects and their parameters, mathematical tools and other services For optimal planning and implementation of urban development/reconstruction of the city, a new method, algorithm and set of applied programs are presented that take into account the mutual influence of urban planning variables, which makes it possible to identify urban planning inconsistencies and optimally solve socio-economic problems. -economic issues of the city (urban system).				
12	Modification of the Voronoi diagram for the module of urban planning and artificial intelligence			
An alternative concept for the sustainable development of urban systems is the so-called Smart City Concept - the concept of integration and system management. For sustainable development and reconstruction of the city, the optimal solution of urban planning - cadastral, land management - is a				

very important issue. Obviously, the neglect of a number of urban planning parameters at the present time (or their combination) creates a lot of problems in the future. Now urban planning tasks are solved on interactive maps, while zoning and related technical data are entered manually. In this case, as a rule, a number of questions are overlooked, and the data are adjusted to predetermined results. As a result, the structural unity of Ubran projects is violated, which leads to uneconomical and inefficient development.				
13	Technical diagnostics of berthing facilities based on the theory of fuzzy sets. Creation of up-to-date applied software systems based on the Poti berth database			
The task of technical diagnostics of berths, buildings and structures is to identify damage and defects in building structures, determine the causes of damage, predict damage dynamics and make a decision on the possibility of further operation of the facility. Existing diagnostic methods are based on the methods of mathematical statistics, which often turn out to be incorrect due to the heterogeneity of statistical data. It can be said that now, in times of data uncertainty, the theory of fuzzy sets and algorithms is an alternative approach for sustainable decision making. Fuzzy modeling, control systems, fuzzy technologies make it possible to use both the subjective opinions of experts and data obtained by measuring the parameters of the diagnostic object when making decisions. Within the framework of this project, based on the statistical analysis of the characteristic parameters of the object of diagnosis and the theory of fuzzy sets, a new method of technical diagnosis of berths was created, which fully meets the solution of the problem.				
14	Software implementation of numerical methods for calculating the inverse Laplace transform			

The purpose of the presented project is to solve some problems of reliability theory by numerical methods. In particular, the project provides for research in the direction of using various numerical methods for constructing descriptive mathematical models of queues of the M/G/1 and M/G/2 types. For many years, publications devoted to this topic have been processed and, based on their analysis, the choice of numerical methods that will be beneficial from a practical point of view for solving problems of the mathematical theory of ranks and reliability. The generally accepted standard mathematical packages either do not contain subroutines for numerical methods for the inverse calculation of the Laplace transform, or only one or two methods are provided. Given that these methods are so actively used in the mathematical theory of ranks and reliability, I would like to bring their great diversity into one system.
As a result of the project implementation, a computer program will be created and implemented in the consumer space, in which numerical methods for calculating the inverse Laplace transform in problems of the mathematical theory of queues (queuing) and reliability will be included in a single system, which, as a result of proper analysis and experiments, will be considered simple and effective for practical use. An appropriate algorithm will be developed, with the help of which it will be possible to choose the most advantageous method from the specified package of numerical methods for solving the problem.

Faculty name -Faculty of Mining and Geology

Accomplished projects

№	Accomplished project title, indicating the field of science and scientific direction	year	Project leader	Project executants
1.	„The study of coal-bearing argillites and clays from the Tkibuli-Shaori coal deposit to	2018-2020		J. Kakulia; D. Kupatadze.

	determine the possibilities of producing clay, fire-resistant materials, and various construction materials“.		G. Maghalashvili	
2.	Technical examination of the country's mining infrastructure (mines, quarries, caves, ropeways, and funiculars) on periodic schedules determined by the Georgian government and in line with the Georgian legislation "Code of Product Safety and Free Circulation"	2018 -	A. Bezhanishvili	A. Gocholeishvili Z. Gordeziani T. Sharashenidze D. Robakidze D. Kupatadze D. Turdzelidze
3.	**"Improved scheme for enriching gold-polymetallic ores: enhancement,**			

	processes, management, and monitoring" Grant Agreement No. FR-18-3398 Scientific area **-2. Engineering and Technologies;** Scientific direction**- 2.7. Environmental engineering - Mineral processing**	2019- 2022	M. Gamtsemlidze	R. Enagel,? D. Talakhadze
4.	Project title: Mathematical modelling of vibrating technological processes and the development of new high-efficiency equipment. LEPL-Shota Rustaveli Georgian National Science Foundation	2018-2021	Viktor Zviadauri	T. Nadiradze, G. Tumanishvili, M. Tsotskhalashvili, G. Gogia, A. Abshilava

	Grant SRNSF # FR 17 _ 292 (20.12 2017 – 20.12. 2020).			
5.	**CARYS -19-284 -American fund** Creating a new, extremely efficient technique for the complex recycling of solid secondary raw materials	**2021.**	N. Shamanauri	V. Zviadauri, G. Tumanishvili, M. Tsotskhalashvili, O. Tsiklauri
6.	Eliminating environmental pollution by vibrations, noise, friction modifiers, and deteriorated nanoproducts of train wheels, rails, and friction brakes	**2021**	Giorgi Tumanishvili	G. Tumanishvili, M. Tsotskhalashvili, A. Bakuradze, B. Bedenashvili
7.	Shota Rustaveli National Science Foundation grant project AR 61/3-102/13 „Processing of the ventilation system of underground structures, taking into consideration the impact of			Zurab Lebanidze (coordinator),

	fire“. Scientific area „Engineering and Technologies“. Scientific direction „Transport engineering“. „Modernization of the ventilation system of road tunnels taking into account the influence of the fire“	2013 -2015	Omar Lanchava	Naom Bochorishvili, (from November 2013 Irakli Bochorishvili)
8.	Shota Rustaveli National Science Foundation grant project №216968 „Implementation of aerosol terrorism prevention techniques for subway ventilation“. Scientific area „Engineering and Technologies“. Scientific direction „Transport engineering“. „Modernization of the ventilation system of road	2016 -2018	Omar Lanchava	Giorgi Nozadze (coordinator) Nino Arudashvili

	tunnels taking into account the influence of the fire“			
9.	Shota Rustaveli National Science Foundation grant project N AR – 19 -1936 „Processing and testing of transformable systems for saving lives in a road tunnel under fire conditions “. Scientific area „Engineering and Technologies“. Scientific direction „Transport engineering“.	2019 - 2022	Leon Makharadze	Omar Lanchava (coordinator), Teimuraz Kunchulia, Nino Arudashvili, Zaza Khokerashvili, Davit Tsanava, Samson Sebiskveradze
10.	Shota Rustaveli National Science Foundation grant project N FR 22-12949 „A study of critical speed and fire-induced backflow in road tunnels in order to save lives”. Scientific area „Engineering and Technologies“. Scientific direction „Transport engineering“.	2023 - 2026	Omar Lanchava	Zaza Khokerashvili (coordinator), Nino Arudashvili,

11.	Developing waterproofing materials, high-efficiency penetrants, and other products through non-residual recycling of some industrial and petroleum waste Project identification code AR-178	Started on April 24, 2018 and finished in September 2022	Guram Khitiri - Project leader	Ioseb Chikvaidze- coordinator Tinatin Gabunia- Researcher Madona Tsurtsumia- Researcher
12.	Obtaining a neutral balance of land degradation in Georgia through restoration and viable management of degraded pastures (Scientific area - Natural science; Scientific direction - Hydrogeology)	June 1– November 20, 2022;	Project funded by the Global Environmental Fund (GEF) ; The project was executed by the Caucasus Regional Environmental Centre under the leadership of FAO.	M. Mardashova - Hydrogeologist; T. Razmadze-Brokishvili - Geophysicist, T. Mikava - Analyst

13.	**„The study of mineral and petrographic composition, as well as the production technology of old and new earthenware vessels (Kvevri)“ MR2017_7.1_4;** Shota Rustaveli National Science Foundation grant project;	20.01.2018 – 20.08.2018;	Leader - Nodar Poporadze;	Rusudan Metreveli
14.	**„Ivrispireti in the Early Miocene: To clarify the Chronicles of Primates Buried in the South Caucasus''?** **№217626;** Shota Rustaveli National Science Foundation grant project;	01.10.2016-30.09.2019;	Maia Bukhsianidze - Project leader	Irma Kokolashvili
15.	**„A thorough geological analysis of the Kazbeg-Omalo region's potential shale gas localities“;**	12.12.2016 - 12.12.2018;	Olga Seskuria - *Project leader;*	Nodar Poporadze; Ia Akhvlediani

	Shota Rustaveli National Science Foundation grant project;			
16.	**„Evaluation and analysis of the hydrogeological and engineering-geological state of the Tbilisi bypass railway“**; Shota Rustaveli National Science Foundation grant project;	2018	Leader - Nodar Poporadze;	Niko Poporadze
17.	**„Study on the mineralogical features of Georgian-Byzantine vitreous enamel using innovative methods “;** PHDF-18-449; Shota Rustaveli National Science Foundation grant project;	14.12.2018-18.12.2020	Ermile Maghradze	Ermile Maghradze
18.	„Creation of nuclear control systems and radiotracer technologies for the	2020-2024;	G. Melikadze-Project leader	T. Mikava; T. Razmadze-Brokishvili.

	protection and sustainable use of ecosystems and natural resources“. IDC: RER1020, International Atomic Energy Agency, Vienna, Austria;			
19.	„Applying nuclear analytical techniques to improve shoreline management in the Adriatic and Black Sea regions“. IDC RER7009, International Atomic Energy Agency, Vienna, Austria;	2020-2024.	B. Melikadze-Project leader	T. Mikava; T. Razmadze-Brokishvili.
20.	**„Evaluation of the third stockpile of the Madneuli quarry's slope stability and water channel arrangement** “;	August-December, 2018	Nodar Poporadze (leader)	Marine Mardashova ; Gela Machaidze; Giorgi Javakhishvili; Zurab Kakulia, Shalva Gegia, Nika Momtselidze

21.	**„Regarding the water flow in the construction boiler placed on Melikishvili Street in Tbilisi“**;	February-March, 2018	Nodar Poporadze (leader),	Zurab Kakulia; Marine Mardashova
22.	**„Hydrogeological factors as determined by the results of field test-filtration work on the area of Bevreti Street, Tbilisi“**;	May-August, 2018;	Marine Mardashova (leader),	Zurab Kakulia , Nika Momtsemlidze
23.	**„Engineering-geological, hydrogeological and lithological (geological) characteristics of the constructing rocks and soils on the grounds of Tbilisi Transport Company bus depot #2 near the former television factory and the fifth building of the fourth microdistrict in Dighomi, Tbilisi and their impact on the distortion of the parking concrete cover“;**	15.11.2019-15.01.2020;	N. Poporadze (Project leader),	M. Mardashova, G. Machaidze, G. Javakhishvli, Z. Kakulia, N. Momtselidze, A. Giorgadze

24.	**„Study of hydrogeological and engineering geological issues in Georgia for the purpose of sensible deploying of natural resources and environmental protection“**;	2018-2022;	Z. Kakulia - Project leader	B. Mkheidze; Z. Varazashvili; G. Iashvili; D. Abzianidze.
25.	**„Examining the resource potential and use options for the quartzite leaching residues found in the mass leaching fields of the Sakdrisi deposit production area“;**	03.06.2019-01.07.2019;	N. Poporadze (Project leader)	M. Mardashova, Niko Poporadze.
26.	**„Evaluation of the stability of the slopes of the fields in the mass production region of "RMG Gold" LLC's Sakdrisi deposit for the particular circumstances of water-saturated rocks“;**	03.06.2019-01.07.2019;	N. Poporadze (Project leader)	M. Mardashova; G. Machaidze; G. Javakhishvili; Z. Kakulia; N. Momtselidze; A. Giorgadze.

27.	**„Identification of the chemical structure of the catalytic grids in order to ascertain the exact amount of platinum, palladium, and rhodium in them“.** Ltd “Rustavi nitrogen”;	2017-2022;	N. Popradze (Leader)	I. Gvalia, S. Gvelesiani, Kh. Gachechiladze.
28.	**„Determination of the Dore? alloy's chemical composition“.** Ltd “RMG GOLD”;	2015-2022;	N. Poporadze (leader)	I. Gvalia, I. Kutelia, O. Seskuria.
29.	**„Petrographic-lithological research of rocks“.** Ltd “Geoengineering”;	2017-2021;	N. Poporadze (leader);	S. Gvelesiani; N. Ikoshvili.
30.	Laboratory study of JSC "Rustavi Nitrogen" manufacturing waste (magnesium nitrate) and establishing its nature;	2022;	N. Poporadze (leader),	O. Seskuria, S. Gvelesiani, E. Bakradze, T. Mikava,Al. Granovsky

31.	**Laboratory analysis of "Russeloisi" Ltd.'s slag waste and identification of its nature;**	2022	N. Poporadze (leader)	O. Seskuria, S. Gvelesiani, E. Bakradze, N. Adeishvili, Al. Granovsky
32.	**Technological analysis of Kolkheti's ancient iron metallurgical manufacturing monuments;**	2022;	G. Inanishvili (leader)	N. Poporadze
33.	**Analyses of ore and slag samples,** LEPL Batumi Shota Rustaveli State University;	2022;	N. Poporadze (leader)	I. Akhvlediani, I. Gvalia
34.	**Laboratory examination and identification of slag waste at "Rustavi Steel" Ltd.**	2022	N. Poporadze (leader)	M. Mardashova, O. Seskuria, S. Gvelesiani, E. Bakradze, N. Adeishvili, V. Abzianidze, Al. Granovsky, T. Mikava, D. Chikvaidze

35.	**Obtaining a neutral equilibrium in land degradation in Georgia through restoration and viable management of degraded pastures.** A project funded by the Global Environmental Fund (GEF);	June 1– December 1, 2022	The project was executed by the Caucasus Regional Environmental Centre under the leadership of FAO.	M. Mardashova - Hydrogeologist; T. Razmadze-Brokishvili - Geophysicist, T. Mikava - Analyst.

1. **annotation**. The resource of clays and argillites described in the Tkibul-Shaori deposit is very large and amounts to hundreds of millions of cubic meters. Thus, in Georgia today, from the point of view of production of clay and aluminum, clays and argillites of coal pile of Tkibul-Shaori coal deposit should be considered as the most promising and real resource base. Research around the topic continues. In particular, with the agreement of other related organizations, the suitability of argillites and clays for use in cement, ceramic and other fields will be studied in laboratory conditions.
2. **annotation**. Estimation of technical condition and delivering of report of danger objects of Georgia (mine, quarry, elevator, escalator, hoisting equipment, side – show, rope way, industrial refrigerator, boiler, automobile gas filling compressor station – on natural gas).
3. **Abstract.** Useful minerals (gold, lead, zinc) are included in the fragments of Bektakari gold-polymetallic ore with grains of fine and uneven size. For the effective enrichment of such ore, it was pre-processed to separate a certain amount of barren rock (waste). From the point of view of preliminary preparation of the material for enrichment, crushing and grinding was carried out to the extent that ensured the maximum opening of useful and barren minerals and, as a result, the maximum extraction of useful components in the enrichment product. The studies carried out on enriching ability included crushing and precipitation operations. Enrichment on the diaphragm precipitating machine made it possible to remove a large amount of barren rock, increase the content of useful components in the concentrate and reduce losses. A certain amount of the finest class (as a dust) was obtained in the crushed product. The leaching method was used to extract them. Along with it at milling at classifier in

closed circle, in circulatory loading the gold-containing particles were collected by freeform. The researches were carried out on the enrichment of sands and sludges by selective and collective methods. As a result, high-quality lead-zinc concentrates and gold-containing product were obtained. Based on the experimental data obtained during the period of research carried out for the automation of key processes, the co uple as well as multiple relationships were constructed between the controlling actions and the enriching indices; the measuring means were selected; mathematical models of processes were constructed, on the basis of which the control methods were elaborated. Obtained as result of the studies, an optimal qualitative-quantitative technological scheme of enrichment was elaborated. The results obtained on the basis of research allow to increase the extraction of lead-zinc concentrates and gold-containing products up to 3%. The experience gained in the project can be used in enrichment of other refractory fine size impregnated ores

4. **S u m m a r y.** As a research object was chosen a vibratory transportation and technologic (VTT) machine for vibratory transportation and processing of materials of various types. The project proposal aims were: Development of the generalized mathematical model of the VTT machine and process; The complex research (mathematical modeling) of the VTT process; Designing of new, highly productive VTT machin es; Fabrication and tests of laboratory samples of the machines.
5. **Summary .** The project involves utilization of secondary raw materials (lead oxide, polymeric materials), development of economically viable and environmentally safe technology, designing, producing, commissioning and installation, putting in operation and testing of the reactor.
6. ANOTATION. Some tribological aspects of modern freight locomotive roadway operation are insufficiently studied. As studies show, perfecting the conditions of interaction of wheels and rails implies a complex, technological and constructive approach to the interaction of locomotive and railway. In particular, proper modification of the mentioned surfaces, adjustment of the profiles of the friction surfaces and reduction of the force and thermal loads acting on the wheels and rails. The aim of the project is to improve the performance of locomotive wheels and rails by tribological and constructive methods: 1) Reduction of the relative sliding and lateral forces at interaction of the wheel and rail by means of the bogie new design; 2) Modification of the wheels and rails interacting surfaces and their tests in the laboratory and field conditions. To achieve these goals, the project envisages the following research and construction-design works: • Development of the mathematical model and mathematical modeling of the locomotive - rail-track spatial vibratory movement caused by periodic asperities (For example wave wear of rails, damages generated as a result of fatigue or other reasons, non-roundness of wheels etc.) existent on the rails and wheels. Investigation of the influence of kinematic, geometric, force and other factors, friction modifiers and modification methods on the tribological and dynamic characteristics of the friction surfaces of locomotive wheels and rails; Modification of wheel and rail guides and roller surfaces with friction

modifiers of appropriate properties, as well as improvement of profile and modification methods; Processing of a new locomotive cart design with reduced deviation from the radial position of the pair, reduced unsprung masses and axial forces; The solution of tribological problems of the locomotive roadway will be based on a new concept of the mechanism of variability of tribal properties of friction surfaces . The workability of the locomotive wheel and rail friction surfaces will be evaluated using the widely used roller analog and existing methods for assessing the third body tribological properties and the degree of rupture in the contact zone under laboratory conditions. The effectiveness of the obtained results will be evaluated based on the results of experimental studies performed in laboratory and field conditions

7. Summary. Fire accidents which took place in Worlds various road tunnels practically proved facts of ventilation system collapse, when system worked non-effectively, resulting in death of people by toxic combustion gas. Above mentioned is caused by algebraic summation of air draught made by fire and air pressure generated by fans. If directions of these two airflows are opposite, frequently airflow is not controlled by fans and is conditioned by fire. I.e., motion of air will be generated by means of occurrence of fire. The observed temperature of ventilating air near the fire's ranges from 1300 to 1650K. The density of the air due to high temperature has been steadily decreasing. This reduction of air density is more intensive when hygroscopic mass transfer takes place from the rock massif through the walls. The variation of the pressure and air density with high temperature and mass transfer from walls often are having the great impact of the ventilation. Accurate definition of ventilation capacity by computer simulation and according to results of the research development recommendations by which life-saving will be more reliable, fire distribution will be interrupted and eradication of damage caused by fire will become easier, from our point of view, is an important task among many of practical problems of exploitation of similar objects. The urgency of the aimed research is apparent also by the fact that even recognized experts have made mistakes by overestimation of ventilation system capabilities in case of fire. For instance, according to 8th article of the report made by group of experts on Saint- Gotthard Road Tunnel fire - the tunnel ventilation worked properly, whereas according to article 9 - people were died as a result of toxic air inhalation - which means that ventilation was not effective (UN, Economic and Social Council, Economic Commission for Europe, Multidisciplinary Group of Experts on Safety in Tunnels, Report TRANS/AC.7/11, February, 2002). Ventilation System will work with descending effect due to fire progress until final collapse. After the collapse will happen it is useless to hope on ventilation system, in this case air motion must be interrupted by putting obstacles on its way. Effective way to do this is inclusion of transformable elements (folding

fireproof systems) which partially or entirely blocks tunnel perimeter. From the above mentioned follows that the development of ventilating systems for mitigation of calamity in road tunnels of Georgia is urgent for steady functioning of mentioned underground structures and also for sustainable development of the economy of Georgia. The final aim of the presented project is to achieve more reliable life safety, decrease material damage and increase effective control on emergency situations in road tunnels for presumed fire scenarios.

8. Summary. An aerosol terroristic attack can be performed without penetrating into the subway, through the technologic specifics of the ventilation system of tunnels. The essence of the problem is that there is a potential hazard of spreading a toxic substance underground using the ventilation channels. The problem is important and relevance due to the fact that none of the subways worldwide has a ventilation system that would be protected against the threat of terrorism, there are no adequate safety requirements established for ventilation and the personnel is not properly trained toward responding thereto. The main idea of solving the problem is based upon: -identification of the vulnerable areas of the ventilation system facilitating carrying out acts of terroristic attacks; -theoretic analysis and computer modeling of the combined action of the piston effect and the ventilators for various configurations of ventilation systems (longitudinal, combined); -studying the scenarios of development of spreading volatile toxic substances in tunnels through computer modeling; -elaboration of the activities aiming toward minimization of any potential danger and development of relevant recommendations for safely exploitation of subway. Novelty of the project is identification of the vulnerable sides of the tunnel ventilation system and technology and development of recommendations that will decrease or totally prevent any potential threat of terrorism. In addition, in cases where preventive measures are insufficient and a terrorist attack occurs, these recommendations will increase the effectiveness of ventilation in terms of saving lives and minimizing the harmful effects and results.
9. Summary. The idea of the research is based on increasing the aerodynamic resistance of the tunnel with the help of a transformable system (TS), which will prevent the spread of combustion products without interfering with people's movement. As a result, in the critical sections of the tunnel, fresh air maintains longer, giving more time for evacuation. The marked event is characterized by a clearly defined time interval, that is the key element to the success of the evacuation and which depends on many components. At the beginning of the 21th century, in newly built tunnels began to build fireproof barriers that can divide the tunnel into short sections. These barriers prevent the spread of fire, smoke and other products of combustion along the length of the tunnels. But this method is not the final decision, due to the fact that there is no place for its

implementation in the "old" tunnels without sacrificing the underground space of the tunnel and its traffic capacity. It should be emphasized that the use of the method of dividing the tunnel into short sections is not envisaged in the design solutions in the tunnels being operated and under construction in Georgia. Based on this the issue of the development of this project is directly vital and very relevant for the conditions in Georgia. Thus, the technology that will be processed in this project is focused on improving safety and survival in the event of the fire in tunnels. The significant indicators of the use of TS will be investigated in according to theoretical and experimental researches provided by this project. In particular theoretical analysis is necessary for the connecting of critical velocity, backlayering length and Froude and Richardson criteria to the fire indicators with and without the influence of TS.

10. Summary. Survival in tunnels during fires is a recognized international problem, on which many researchers work around the world. Georgia plans to build more than 50 road tunnels in the next 3-5 years. Inspecting the design decisions of these tunnels revealed that the only significant risk factor for them is the fire. Based on this the issue of the development of this project is directly vital and very relevant for the conditions of Georgia. The critical velocity of ventilation and the opposite diffusion of smoke in the fresh air current are important technological values in emergency ventilation projects. The idea of using the critical velocity and the critical Froude Number implies rapid mixing of equal amounts of flue gases and fresh air at the hearth of the fire, what is not always the case, particularly when the width of the tunnel carriageway significantly exceeds its height. International recommendations to design emergency ventilation, as well as fire safety guidelines of the USA, share the view that the critical velocity of a ventilation can be used to control smoke in tunnels in case of any fire. Nowadays, accepting this view without criticism is a big mistake. The essence of the problem lies in the critical analysis of the obsolete scientific concepts and in gaining results based on the concept introduced by us suggesting that fires cause dynamic pressure higher than the static pressure induced by tunnel fans. Therefore, in the present paper, we plan to conduct the studies, which will distinguish between the cases: 1. when, based on the available classical knowledge, it will be possible to develop emergency ventilation projects to save lives, and 2. when the available knowledge is no longer sufficient to realize the mentioned projects and novel study results are needed to develop a new approach to the problem.

11. As a research object was chosen a vibratory transportation and technologic (VTT) machine for vibratory transportation and processing of materials of various types. The project proposal aims were: Development of the generalized mathematical model of the VTT machine and process; The complex research (mathematical modeling) of the VTT process; Designing of new, highly productive VTT machines; Fabrication and tests of laboratory samples of the machines. **The grant project was realized in the following succession:** A generalized dynamical model of the vibratory technologic machine with the load was developed on the base of systemic approach. A mathematical model of spatial movement of the system "vibrodrive – working member – technologic load" in the form of the system of differential equations was developed. A systemic approach ensures to describe both, the independent movement of masses and their interconnection and consequently their mutual influence. The mentioned interconnection was realized by nonlinear terms in the form of products of coordinates, velocities and accelerations retained in the systems of equations. A complex study of the friable material vibratory technologic process (transportation velocity, intensity of the load movement relative the working member surfaces, mutual dynamical influence of the material and working member etc.) was carried out. The modeling was carried out at variation of the constructional and physical (rheologic) parameters of the mentioned system in the wide range and under real laws of the vibro-excitation. The graphs of the material dynamical characteristics depending on variation of various parameters were plotted, whose analysis showed tendencies towards improvement of the technologic process. The shop drawings were developed and new electromagnetic vibratory feeders were fabricated: 1) with rigid bottom having independent rotary movement; 2) with vibrodrive having a variable mode; 3) with the bottom having elastic plates with independent movements. The numerical and physical experiments showed advantage of the new original designs in comparison with the existent ones that reveals the real prospects of their use in local, as well as foreign enterprises. From the reviews of our reports to the international

scientific conferences and publications in the highly rated journals appeared the real reasonings for widening and deepening the international collaboration.

12. Summary.The object of the study was a vibrating transport-technological (VST) machine for vibrating transportation and vibration processing of various materials. The goals of the project proposal were: development of a single generalized mathematical model of the VST machine and process; complex research of the VST process (mathematical modeling); Designing new, high-performance constructions of VST machines. Making and testing laboratory samples of machines.The grant project was implemented in the following order: Based on the stem approach, a generalized dynamic model of the spatial motion of the vibrating technological machine with the load was developed.The mathematical model of the spatial movement of the system "vibrodrive - working body - technological load" was worked out, in the form of a system of differential equations. A systematic approach allows to describe both the independent movement of masses, as well as their interrelationship and, accordingly, mutual influence. The mentioned relationship was implemented in the system of equations with non-linear members in the form of products of coordinates, velocities and accelerations. The vibrational technological process of loose material was carried out (speed of transport, intensity of movement in relation to the surfaces of the working body, dynamic mutual influence of the material and the working body, etc.)

Graphs of dependence of the dynamic characteristics of the material on changes in various parameters were created, the analysis of which showed directions for improving the technological process. Design drawings were processed and new, electromagnetic vibrating feeders were manufactured: 1) with a new, independent motion (rotary) rigid bottom; 2) with a new, variable-mode vibration drive; 3) New, elastic plates with independent movement bottom. Numerical and physical experiments have shown new, original constructions compared to existing constructions, which shows the real prospects of

their use, both in local and foreign countries. Real foundations for expanding and deepening international cooperation have emerged from feedback received on reports of scientific results at international scientific events and publications in prestigious journals.

Faculty of Transport Systems and Mechanical Engineering;

Implemented Projects 2018-2023 წწ

	The name of the completed project, indicating the field of science and scientific direction.	Year	Project leader	Project executor
2.	Impact of radiation defects on semiconductor materials and devices based on them (detectors, sensors). physics.	2022	Tornike Kimeridze.	Tornike Kimeridze, Givi Sanadze, Natia Jalagonia.

Summary: Currently, silicon-germanium components are widely used in microelectronics for the manufacture of analog-to-digital converters and processors. Their reliability, power consumption and degree of integration depend significantly on the perfection of the structure of SiGe materials. It is worth noting that SiGe circuits emit less heat during operation than its competitors InP and GaAs, which shows their worse thermal stability. SiGe-based BiCMOS (large-scale integrated circuits on metal-oxide-semiconductor SiGe) enables the realization of many operational-computational functions on one chip for complex functional devices. SiGe technologies have real prospects for use in high-frequency measurement systems. At the same time, this technology is focused on wide commercial use, unlike

InP and GaAs, which are in demand only for narrowly specialized areas. The rapid reduction in vertical and horizontal dimensions of transistors has ensured the dominance of SiGe-heterobipolar transistors in the integrated circuit market for wireless and fiber optic communication systems. Modern industrial technologies already produce nanosized transistors based on SiGe. Various types of radiation can be applied to electronic equipment: γ-rays, flow of electrons, protons, neutrons and heavy particles, solar radiation, nuclear explosion pulses. All types of radiation significantly affect the electrophysical characteristics of semiconductor devices, in particular, SiGe transistors. High immunity to γ-radiation is required for instruments and circuits that function in the electronic equipment of space vehicles. Also, nuclear energy research devices, specific physical experiments and military equipment.

3.	Impact of electromagnetic radiation on the environment. chemistry. Ecology.	2022	Natia Jalagonia.	Natia Jalagonia.Tornike Kimeridze, Givi Sanadze,

Summary: Metals are most often used as electromagnetic radiation absorbers, because they are characterized by high electrical conductivity. However, due to their high density, low flexibility, susceptibility to corrosion, and difficult processing, the use of metals and metal composites in modern engineering is limited. To overcome these limitations, there is great interest in polymer materials and composites, because they are very easy to process, they are characterized by simplicity, resistance to chemical agents and corrosion, and regularity. Rebar with structural and mechanical properties. It should be noted that unlike the ability of metals to reflect electromagnetic waves, polymer-based materials are characterized by electromagnetic waves. With the ability of absorption and strengthening of this property is possible through chemical or additive doping.

The use of three-component nanocomposites containing polymers, nanoparticles of magnetic metal compounds, and carbon fiber nanomaterials is promising. The main advantage of three-component nanocomposites is the synergistic effect between the components, as a result of which they have excellent electrical, optical, sensory, catalytic, mechanical properties. and magnetic properties, thermal stability.

The analysis of literature data showed that composites based on polymer-lithium-sandwich nanomaterials have a high potential for practical use in industry, medicine, and energy. and by considering their multi-functionality in human life. However, their practical use is hindered by the complexity of the synthesis of the polymer composite, which is determined by the strong aggregation ability of nanoparticles with high surface and thermal energy. Because of this, it is necessary to stabilize the nanoparticles in the polymer matrix during the synthesis process.

4.	Creation of a flexible small production site for the production of stair lifts for persons with disabilities	2023	Vazha Qiria	D. Tavkhelidze, M. Janikashvili, T. Dzagania, L. Metreveli
Summary: The project is related to the establishment of a small flexible production area, where the main business object is defined as stair-moving devices for persons with disabilities, the necessary use of which in public, medical and educational system institutions is defined by the legislation of Georgia. Based on the diagrams of devices for moving up stairs, depending on various technical and economic features, for the production of a platform moving along of stairs and a tracked device (patents: R 2022 7356 B and R 2022 7381 B), a project plan for a flexible production site. The flexible enterprise we propose will be based on a university enterprise and will be equipped with computer-controlled (CNC) machine tools. This allows us to manufacture the above devices for the disabled, as well as some wear and replacement parts for various purposes, maintaining a balance of quality and price.				
5.	AR-18-613. - Production of pilot samples of small wind power plants using basalt fiber, installation, testing, determination of operating parameters. Main directions: 1. Engineering technologies; 2. composites; 3. mechanical engineering	2019–2023	Merab Shvangiradze	V. Bachanadze; M. Nikoladze; D. Butskhrikidze; V. Shilakadze; G. Pofkhadze; A. Ugulava; I. Batsikadze
Summary: Georgia has desirable conditions for the development of wind energetics. Therefore, it is advisable to carry out research and practical work in this direction. The content of the applied project performed by us serves this purpose. It is necessary to apply polymer composite materials for the manufacture of wind generators, as they would be applied to create lightweight and high-strength wings. It is obvious that the main acceptable component of polymer composite material, reinforcement fiber in Georgia is produced as basalt fiber. During the project we researched and studied the technological process of obtaining polymer composite materials and the possibility of manufacturing wind generators from it. As a power unit we use Chinese-made generators with power: 0.5-0.54 kW, 2-2.5 kW, 3-3.5 kW. And 5-7 kW. We have wings and wind rotors with appropriate parameters for each power. According to the mentioned power, the diameters of wind rotors are 2.67 m, 5 m, 6 m, and 9.2 m. The rotors are all				

with three-bladed. In addition, according to the project plan, we have constructed wind generator housings with a wind direction orientation tail and a vertical wing. Considering that the project is practical, its essence is to design wind generators, create their manufacturing technologies and make pilot items that was implemented during the project. Technical equipment and installations are usually quite expensive products when was purchased abroad. Naturally wind generators also belong to such equipment. The price of electricity generated by wind generators bought abroad is quite high for the population of Georgia. Consequently, bringing them is devoid of any rent. Therefore, of course, it is advisable to master the production of wind generators in Georgia. This project correctly serves the possibility of mastering the technology of manufacturing wind generators in Georgia. Accordingly, a precondition is created for the production of household wind generators in Georgia. For example, the Georgian Technical University has a sufficient intellectual level, production facilities as well as service staff.				
6.	CARYS-19-573 Develop and manage innovative bioagrotechnology to protect the environment from global pollution and increase crop yields	2020-2021	Nana Bakradze	Nana Bakradze Giorgi Pofkhadze Teimuraz Dumbadze Nino Gagelidze Natia Sukhishvili
Summary: In order to increase the yield of crops and protect the environment from global pollution, an innovative bioagrotechnology of wheat production has been developed; The positive effect of wheat seed pre-sowing two-step treatment (with laser irradiation and Azospirillum Brasiliense suspension) on wheat germination, growth and development under greenhouse and field conditions has been established. pre-sowing treatment of wheat grains with laser and with laser in combination with Azospirillum brasilense increases the yield by 18-35% and reduces the risk of crop fungal disease as well. This, in turn, ensures an increase in the supply of food to the population for a healthy life and the fight against hunger.				
7.	NFR–22-6966 Quantitative and qualitative evaluation of phenolic compounds of wheat processed with laser bio-agrotechnology in order to make a health-improving drug.	2023-2026	Tamar Sanikidze - Medical University Nana Bakradze - STU, Head of Laser Technologies Group	Nana Bakradze Teimuraz Dumbadze

Summary: Cereals are considered a strategic product all over the world, therefore their production is a priority for all countries in order to provide for the population. Local wheat production in Georgia provides 15-20% of the country's needs. In order to increase wheat production and enrich it with useful compounds, it is important to use new technologies.

The mechanisms of the positive effects of laser radiation have not yet been fully established. There are only fragmentary studies and hypotheses devoted to studying the mechanisms of the effect of laser radiation on plant seeds. Despite numerous studies of laser-induced phenolic compounds and their beneficial properties in wheat grains, germinates of seeds, and grass seedlings, data are insufficient

Refined wheat grains, which flour mainly is used for bread production, are poor in antioxidant compounds and are a risk factor for the development of obesity, diabetes, and metabolic syndrome. Wheat grains are contaminated with many microorganisms, insects and are exposed to many harmful environmental factors. Wheat husk, grain germinates, and grass seedling are rich in biologically active phenolic and other compounds and can be used to form functional preparations.

Planned research involves the stimulation and accumulation of phenolic antioxidants in laser-treated wheat, thus increasing the antioxidant status of baked bread and its positive impact on the human body. Wheat grains are susceptible to many diseases. Accumulation of phenolic compounds and phytoalexins is characteristic of plant (and including wheat) phyto-immunity. Study of bioactive compounds generated in wheat grains germinates, and grass seedling in animal cell model systems (Jurkat, MDCK) will reveal highly active compounds to form a functional therapeutic and prophylactic drug. Creation of functional, immunomodulatory drugs, especially important during the COVID-19 pandemic.

The novelty of the proposed study lies in the combination of different approaches:

- Increase wheat grain yield, pest resistance, and utility by developing innovative laser bio-agrotechnology.
- Study of compounds in laser-treated wheat grain germinates in animal cell model systems (Jurkat, MDCK).
- Creation therapeutic-prophylactic, immunomodulatory functional drugs.

8.	Implementation of the entire cycle of production of metal-cutting weapons in the production union "Tbilaviamshen	2021- 2022	M. Kakhiani	G. Ivanishvili M. Asanidze O. Kurtskhalia G. Kupreishvili

Summary: The mentioned project provided for the introduction of the production process for the production of metal cutting tools on the basis of the production association. The working group included specialists from various scientiffc and industrial fields. During the past period, the preliminary design works have been fully completed. Namely: study

of the world market of metal cutting tools; selection of nomenclature for the production of fiend mills and zenkers; determining the optimal geometrical parameters of the tool to be manufactured; determining the optimal geometrical parameters of the tool to be manufactured; selection of raw materials for the manufacturing tool and its competitive suppliers; establishing connections with them; selection of modern cutting tool manufacturing machines on the world market; selection of software for the mentioned machine tools; determination of all components of production and technical support.				
9.	"Case Analysis of the Georgian Transport Sector, Interoperability and Intermodality with the European Systems" - Shota Rustaveli National Science Foundation of Georgia (N YS-2016-41).	2016-2018	Boris Gitolandia	Boris Gitolandia
Summary: The project dedicated to discusses the problem of interoperability and intermodality of the transport sector of Georgia with the European transport systems and provides the results of the research analysis. The compatibility of Georgian transport and its infrastructure with European systems, technical parameters and other problematic issues of challenges in this regard are listed and shown, ways to solve the problem and further prospects for adaptation to EU standards are proposed. Within the project is prepared monography and this is intended for scientific workers, master's and doctoral students in the field of transport, the monograph will also provide great help to specialists in the field. It is possible to present the results of the research in a lecture format to students of the relevant specialty, professors and teachers, expert circles and people interested in the issue in general.				
10.	Management of production logistics processes 2021 Rezo Thedoradze st. Urushadze	2021	Rezo Thedoradze	K. Urushadze G. Sisvadze
Summary: The tasks of production logistics include managing material, financial, and information flows, both within the logistics system and within the overall framework of the production process. Software -instrumental means of these systems are known in practice in the name of "MRP1, MRP2, and EARP systems" and their implementation in the industrial activity of Georgia is a generally recognized ideology, technology, organization and standards for the management of industrial enterprises. These systems are characterized by a high level of management automation and can realize the following main functions in the industrial sector of our country: development of a unified plan for raw materials, materials, and complementary products; control and optimal regulation of the level of production stocks; various services of the enterprise (branch) (Supply, Manufacturing, and Turnkey), action agreement and operational adjustment of their plans in real-time.				

11.	Device for diagnosing wear and damage of rails and rails. Scientific field: railway Scientific direction: information technologies 4-140. - the Shota Rustaveli National Science Foundation of Georgia	2015-2018	N. Mghebrishvili	A. Dungeon N. Kvatchadze

Summary: By installing the proposed device on each pair of individual rolling stock units (wagons), automatic control of the pair and rail condition will be achieved. In particular, the rolling stock:
- Detecting worn out pairs of eyes and determining the degree of wear;
- detection of a damaged pair of eyes;
- Fixing a worn or damaged pair of eyes.

Based on a mathematical model developed and compiled in advance:
- detection of worn rail;
- detection of damaged rail;
- Determining the exact location of a worn or damaged rail.

A mockup is made.

Faculty of Informatics and Control Systems

Completed projects

No	The name of the completed project, indicating the field of science and scientific direction	year	Head of the project	Project manager Lebi
1	Shota of Rustaveli National Scientific fund Ph.D educational programs Grant # N PhDF-18-494 – ” on blockchain based on biometric	2018-2020	Prof. _ A. _ Frangishvili , Prof. _ L. _ Imnaishvili	PhD student Ketevan It's dough

	election system Processing and research ". informative technologies			
The study was devoted to the issue of perfecting electoral systems. Traditional and electronic election systems, biometric election systems were studied within the framework of the project; A critical analysis was conducted to reveal the advantages and disadvantages of the mentioned election systems; The dynamics of the development of the existing electoral systems were highlighted. In order to improve the existing election systems, a new election system was developed, which ensures the conduct of reliable, trustworthy and fraud-proof elections. As a result of the research, the issue of voter identification and reliable storage of sensitive data was highlighted. Biometrics were used for guaranteed identification, and blockchain for reliable data storage. Accordingly, the architecture, protocols, algorithms and physical model of the blockchain-based biometric election system were developed. The physical model of the developed electoral system was tested in the form of an experiment. The experiment was conducted at the Technical University of Georgia on December 12, 2020, an election simulation was conducted. 100 participants took part in the experiment. All 100 of them were able to make their choice without any problems. It is worth noting that the voter could vote both at the polling station and remotely, for this the voter's computer was equipped with appropriate software and hardware tools. It should also be noted that the voter had the opportunity to verify his vote in the election. The experiment was successfully completed, the efficiency and reliability of the developed election system was highlighted. The blockchain-based biometric election system developed as part of the research minimizes the possibility of falsifying the elections, if it is implemented, the public's approach to the elections will change: they will know that the election results cannot be falsified, and their desire to participate in the elections will increase. The development of the proposed electoral system may take place in several directions. It can be used to build electronic systems for conducting election processes at different levels, not only for conducting elections nationwide, but also for local elections (for example, midterm elections), for municipal elections, for local elections of organizations (for example, student self-government elections at the university level), for closed voting, Open for voting. Therefore, a wide area of application of the developed blockchain-based biometric election system is outlined.				
2	**შოთა რუსთაველის ეროვნული სამეცნიერო ფონდი.** cyber security new challenges global informative in space	2018-2019	Nani Arabic	Nani Arabic

	Computer and informative Sciences			
The project "New challenges of cyber security in the global information space" is a seasonal school. At the training events conducted by Georgian and foreign specialists working in the field of information security, the trainees had the opportunity to create a complete understanding of the threats in the modern digital information space, both globally and throughout our country. Fifteen young scientists interested in the field of cyber security participated in the project. They raised their qualifications on the research methods of the mentioned field, developed skills of transferable interdisciplinary cooperation, and what is also important, with the involvement of foreign lecturers, they were integrated into the international scientific space.				
3	The World Bank, the Ministry of Education, Science, Culture and Sports of Georgia (MOESCS), the National Center for the Development of the Quality of Education (NCEQE) and the Center for the Professional Development of Teachers (TPDC) - Strengthening the quality of teachers in professional education and training.	2020-2021	arsenic Gogatadze	Nani Arabic
The goal of the project was the development of professional IT programs; Creation of evaluation tools using modern approaches and methodologies in information technology modules and training of IT trainers in the field of professional education (ToT) according to the mentioned methodology.				
4	open of science development promotion program informative of technology direction	2022	Zurab Gasitashvili	Vl . is a person
Within the framework of the "Open Science" grant, a wide database was developed for the research institutes of the university, which includes a wide database of different categories of scientific workers over the past 20 years, research technologies in the research institutes, and others, on which both relevant Excel files and a web page were created.				

5	" Parallel programming algorithms research Multidimensional for tasks ". Applied mathematics _ Computer sciences ;	2022-2023	Romeo Galdava	Nani Arabic
The main goal of the project was multidimensional Research of second-order accuracy parallel type algorithms for tasks, determination of their stability, convergence conditions, discussion of issues of dependence of calculation accuracy on various parameters and further analysis.				
6	**Digital citizenship at school** Computer sciences ; • Informational Science	2023	Nana It's Dikhaminji	Nani Arabic
The project is implemented by STEM teachers with the association in partnership with and implemented by General Education of the institution Training/retraining of teachers in the following subjects: " Digital Security ", " Artificial of intelligence abilities and dangers "; " Why? Media literacy ? "; Cyber security The need for education and Career " .				
7	ERASMUS+KA2 project " of Georgia higher educational institutions Research opportunities raise higher of education research and on development (HERD)" (grant Agreement No. 598207-EPP-1-2018-1-GE-EPPKA2-CBHE-SP). Direction : informative technologies	2020-2022	Prof. _ Nino Okribelashvili	Z. _ Tsyramua , Z. _ Gasitashvili
ERASMUS+KA2 project "Increasing research capacity of Georgian higher education institutions on higher education research and development (HERD)" (grant agreement No. 598207-EPP-1-2018-1-GE-EPPKA2-CBHE-SP). Georgia was created within the framework of the project Scientific informative System A - www.gtis.emis.ge. _ it hand helps Research activity planning , implementation and assessment . platform will help universities of grants and projects in management , research results dissemination Countable indicators (publications , patents , conferences and A. _ Sh .) in processing . portal will unite information in Georgia academic institutions activity , human resources and infrastructure about .				

<table>
<tr><td colspan="5">this of purpose to achieve The following was implemented Tasks :

• Joint Research platform create which _ hand helps target in universities Research activity planning , implementation and assessment
• was created Georgian online Research The portal , which shows the latest information in Georgia academic institutions activity , human resources and infrastructure about .
• University administrative staff research of management and data analysis skills improvement high quality research of management For production , institutional research data to analyze and Further forecasting and strategic for planning .
• target universities opportunities strengthening research transfer and University - industry cooperation in the direction</td></tr>
<tr><td>8</td><td>Computer systems diagnosis and analysis laboratory (computer Hardware Uz - damage and Computer architecture)</td><td>2019</td><td>Alexander Benashvili</td><td>Alexander Benashvili</td></tr>
<tr><td colspan="5">According to the project, a training laboratory was realized on the basis of the IT training and research laboratory of the Faculty of Informatics and Management Systems. The computer systems diagnostics and analysis laboratory is equipped with Ultra-X diagnostic kits. The device is of industrial purpose and natural laboratory works are carried out on its basis. Students develop such practical skills that facilitate their further employment in computer systems manufacturing and service companies without additional study courses and trainings.
Generations of processors and design standards will be studied in the laboratory. System board chipset and specifications, interfaces, accumulators, controllers, power supply and power supply issues of computer components. Students will learn how to diagnose a computer and determine the characteristics of its components. As a result of the acquired knowledge, the student will be able to independently assemble, modernize and debug a computer system , use diagnostic hardware and software, and provide computer service.
For the needs of the laboratory, appropriate teaching-methodical literature was developed.</td></tr>
<tr><td>9</td><td>Implementation of IT professional educational cluster in the professional education system of Georgia and development of e-learning platform for LLL. informative of technology direction</td><td>2019</td><td>Zaza Cyramua</td><td>Vl . is a person</td></tr>
</table>

The project aims to increase the level of IT education and the employment rate of graduates in the professional education system of Georgia, and especially in its regions. For this, training of instructors, preparation of current training materials and e-learning are provided. Creation of a platform, which will lead to increased access to information technology educational materials throughout Georgia.				
10	Development of online training programs related to IT informative of technology direction	2019	Prof. Nani Arabic	A. Prof. Vl. Adamia
project as a result was created general Module " Informative of technologies " Electronic educational course college of students and For teachers , Georgia all Professional educational for the institution . " Informative Technology module _ is Mandatory educational module all type for the program and he is taught of colleges all on specialty . presented Electronic (distance) course was first large scale electronic course which _ was introduced of Georgia professional of education in the system . project as a result created electronic course successfully implemented It was done all Interested in college				
11	A single integrated web platform for urban system modeling and management	2020	Nino Imnadze Merab Akhobadze	Elguja Kurtsakhli is Irakli Shalamberidze Otar Mchedlishvili David Curtskhalia , Maia Dolidze , Marika Bregvadze , Natalia Takidze .
The unified web platform of the "smart city" means a software system that allows users to record and process various processes and parameters of city objects with systematic mathematical and software tools. The web platform includes: website, Google Maps map, databases, control panel, registration-authorization of users, marking of objects on the map, memorization of objects and their parameters, mathematical tools and other services. For the optimal planning and implementation of the urban development/reconstruction of the city, a new method, algorithm and applied software package is presented, which takes into account the mutual influence of urban variables, which allows to identify urban inconsistencies and optimally solve the socio-economic issues of the city (urban system).				
12	A modification of the Voronoi diagram for the urban planning and artificial intelligence module	2021	Nino Imnadze Merab Akhobadze	Elguja Kurtsakhli is Irakli Shalamberidze Otar Mchedlishvili David Curtskhalia ,

				Maia Dolidze , Marika Bregvadze , Natalia Takidze
An alternative concept of sustainable development of urban systems is the so-called Concept of smart city - concept of integration and system management. For the sustainable development and reconstruction of the city, the optimal solution of urban planning - cadastral, land management - is a very important issue. Obviously, neglecting a number of urban parameters at this time (or combining them) creates a lot of future problems. Now urban planning tasks are solved on interactive maps, during which zoning and related technical data are entered manually. In such a case, as a rule, a number of issues are overlooked and the data is adjusted to predetermined results. As a result, the structural integrity of urban projects is violated, which leads to uneconomical and ineffective development.				
13	Technical diagnosis of berth facilities based on the theory of fuzzy sets. Creation of appropriate applied software systems on the database of Poti berth	2022	Teymuraz Boolean Merab Akhobadze	Elguja Curtskhalia , Marika Bregvadze , Valery Khvichia , Ketevan Abashvili , Theona Bidzinashvili - Rusishvili
The task of technical diagnostics of berths, buildings and structures is to detect damage and defects in construction structures, determine the causes of damage, predict the dynamics of damage and make a decision on whether it is possible to operate the object further. The existing methods of diagnosis are based on the methods of mathematical statistics, which are often incorrect due to the non-uniformity of the statistical data. It can be said that now, in the time of data uncertainties, the theory of fuzzy sets and algorithms is an alternative approach for sustainable decision-making. Fuzzy modeling, management systems, Fuzzy technologies allow to use both the subjective opinions of experts and the data obtained by measuring the parameters of the diagnostic object when making decisions. Within the framework of the mentioned project, based on the statistical analysis of the characteristic parameters of the diagnostic object and theories of fuzzy sets, a new method for the technical diagnosis of berths was created, which completely responds to the solution of the set task.				
14	Software implementation of numerical methods for calculating the inverse of the Laplace transform	2022	Ramaz Khurodze Revaz Kakubava Merab Akhobadze Elguja It's a kiss	Teymuraz Saginadze
The aim of the presented project is to solve some problems of reliability theory by numerical methods. In particular, the project envisages research in the direction of using different numerical methods for descriptive				

mathematical models of M/G/1 and M/G/2 type queues. Over the years, the processing of publications dedicated to the mentioned topic and, based on their analysis, the selection of numerical methods, which will be advantageous from a practical point of view for solving the problems of the mathematical theory of ranks and reliability. Common standard mathematical packages either do not contain any subroutines for the numerical methods of inverse computation of the Laplace transform or only one or two methods are presented. Given that these methods are so actively used in the mathematical theory of ranks and reliability, it would be desirable to bring a wide variety of them into one system. As a result of the implementation of the project, a computer program will be created and introduced in the consumer space, where the numerical methods selected for calculating the inverse of the Laplace transform in problems of the mathematical theory of queues (mass service) and reliability will be integrated into a single system, which will be considered easy and effective for practical use as a result of proper analysis and experiments. An appropriate algorithm will be developed, using which it will be possible to select the most favorable method from the mentioned package of numerical methods to solve the problem.				
15	Phase separation in biology. Biology, STEM-22-365	2023-2024	Davit Svintradze	Tengiz Buchukuri
The research includes the extension of differential geometry for moving surfaces to describe the biological properties of cell surfaces and the processes taking place in them, commonly known as moving surface accounting (CMS) in the course of its development, P. Greenfeld introduced a system of nonlinear equations to describe the motion of massive thin fluid layers. Using CMS, we generalized p. Greenfeld's equations so that they are applicable to any surface, and we introduce the pseudo-Riemann equations of motion of the manifold in the dynamics of a two-dimensional surface closed in an electromagnetic field. The equations of motion we derive describe the change in the bounded volume and are not limited by modeling the surface, so it can be anything: a liquid thin layer, a diffusion layer (interface) separating a liquid or solid body and gas phases, it can be a soft material, it can be massive or Initially massless, uniform or non-uniform, be or not be in equilibrium with the environment, etc. The solution to the Greenfeld equation comes into play when the surface is in thermodynamic equilibrium with the surroundings. The equations describe how a surface changes when it is far from equilibrium and deviates greatly from the Young-Laplace law that applies when a surface approaches its thermodynamic equilibrium. Theoretical results and numerical experiments allow to explain some phenomena of cell surfaces. In this direction, a scientific paper is being prepared for an international scientific journal.				
16	Development of SCADA training discipline. Scientific directions: engineering/pedagogy. Scientific	2023–2024	Imnaishvili Levan	Bedineishvili Maguli

	fields: computer engineering/pedagogy. Dates:			
It involves the modification of the laboratory complex and, therefore, the training courses, taking into account modern roasting. In 2023, a modification concept was developed, according to which a new module will be added to the SCADA laboratory stand and the SCADA software package will be replaced.				
17	"Publishing State Scientific Grant Competition" Grant Number: N: SP-23-392 Grant Title: Cyber Security Challenges, Concepts and Practices Link: https://rustaveli.org.ge/res/docs/4a1086165e7e7f7eee8a87df3dfb17ad347f2e05.pdf	2023-2024	Nani Arabic Zaza Tsiramua	Vladimir is a man Akaki Shekiladze
As a result of the implementation of the project, a guide will be created in the direction of cyber security, where modern cyber threats and practical methods of combating them will be described.				
18	EU Erasmus+ - project number N# 101127144 — MICRO-GEAR Implementation of micro-certificates in higher education systems of Georgia and Armenia: South Caucasus beacon project.	2023-2025	Adamia Vladimir	
Within the framework of the project, a legislative initiative will be prepared, within the framework of which micro-competence modules will be introduced in higher educational institutions. Within the framework of the project, the network technician - microcompetency module will be developed and the interested personnel will be trained in this direction.				
19	Student scientific conference "Thoughts on the future - future world". "Together" innovative activity promotion center of STU	2023-2024	Tamar Lominadze Lili Petriashvili, Zaza Buachidze Merab Akhobadze Elguja Kurtskhalia is Marika Bregvadze	Amiran Kimadze

			Natalia Shavshishvili	
For the international student conference - "Thoughts on the future - the future world". (the topic of the conference includes the directions of all faculties of STU), which will be held in October 2024: a website was created for the international student scientific conference - "Thoughts on the future - the future world". https://fiqrebimomavalze.gtu.ge/ge - the project covers the direction of all faculties of STU.				
20	"Student Patent Bureau - Future Projects". "Together" innovative activity promotion center of STU	2023-2024	Tamaz Urtmelidze Merab Akhobadze Marika Bregvadze	Amiran Kimadze Mariam Datunishvili *Alexander Lortkipanidze*
The foundation was laid for the creation of the student "Patent Bureau". At the end of the current year, the specialized website "Future Projects" was launched. (The project is defined to identify and support students gifted with creative and creative talents of Stu, so that they have a desire to create and realize interesting ideas, proposals, projects. To think not about looking for jobs, but to create jobs themselves). Through the site, students will find help both in the formation of a "patent" application and in the realization of real projects and ideas. *Website - "Student Patent Bureau - Future Projects". https://patents.amirandev.com/ge - performed by Amiran Kimadze. Within the framework of the mentioned project, a Memorandum of Student-Student mutual cooperation was created - performed by Mariam Datunishvili. A logo was also created for the site - artist Aleksandre Lortkipanidze.* The project includes all faculties of STU.				
21	"Planning of the surrounding area of cultural heritage monuments based on the Voronoi diagram method" (student project). "Together" innovative activity promotion center of STU	2023	Merab Akhobadze Nino Imnadze	Giorgi Kvitsinashivli Marika Bregvadze
The tourism industry in Georgia is characterized by diversity, which is aimed at revealing the specifics of the place and planning new tourist routes. However, the development of tourism is impossible without proper infrastructure . The existing tourist infrastructure needs planning and a special architectural solution taking into account modern requirements The problem lies in how and with what methods the existing historical environment should be intervened in such a way as not to disturb the harmony of visual perception between the historical monument and the new architecture.				

The number of tourists in Georgia is increasing every year. More and more tourist bases, facilities and routes are being built. Accordingly, the role of architects is increasing in order to increase the tourism industry, to provide a comfortable and safe environment for tourists. All this requires the optimal arrangement of new infrastructural facilities in the vicinity of cultural monuments, the arrangement of recreational spaces in a new way, the determination of the shortest way from any point of the tourist area to the destination point.				
22	"Economic space planning taking into account the potential and risks of service facilities" (student project). "Together" innovative activity promotion center of STU	2023	Merab Akhobadze Anzor Abralava Tamar Rostiashvili (co-head of the project)	Salome Fodiashvili Marika Bregvadze
The urban system, city-building and spatial planning are generally based on the principles of sustainable development, which ensure the creation and maintenance of decent living conditions for the population, the harmonization of the use and development of the relevant territory, economic and social prerequisites, and the preservation of long-term development potential. Effective alignment of transport/engineering infrastructure with the global urban system. Access to communications, information and development of social infrastructure. Such planning requirements and principles correspond to the fractal principle of planning, which belongs to the so-called Voronoi diagram method. Based on the developed algorithms, a software system was created that allows the spatial-economic zone to be divided according to the power (potential) of the objects included in the spatial economic area. The program is written in javascript programming language and can be used through any internet browser. The Google Maps library is used to display the map, and the HTML5 Canvas API is used to draw the diagrams. The received algorithms allow us to create a comfortable living space for the population and organize the infrastructure of the region, road communications with the lowest costs. Place business centers and organize the transport and communication network of the region optimally with the lowest costs.				
23	Project - "Control of Black Sea Safety and Pollution Risks Using Numerical Models", SPS G6028, NATO, USA, Georgia, Ukraine, Romania, Bulgaria, Turkey	2023-2025	*Gia Surguladze* *Lia Petriashvili* *Nino is a gun*	
One of the main goals of the project is to develop a mathematical (numerical) modeling system with appropriate software that will allow us to model and predict the spread of oil products and other pollutants in the sea or caused by anthropogenic or terrorist acts . This system should provide rapid prediction of contamination zones and concentrations in order to minimize the negative consequences of accidents.				

24	Digital corpus of Abkhazian translations of "Vepkhistkaosni".	2023		
Digitization of Abkhazian translations of Shota Rustaveli's poem "Leopard Skinner" and the creation of a Georgian-Abkhazian parallel corpus of "Leopard Skinner" to make it possible to research the Abkhazian translation of the poem using digital methods.				
25	Real-time rolling stock identification system, Technical University of Georgia and Georgian Railways	2023-2024	Lili Petriashvili	Tamar Lominadze Nona is four-sided Mzia Kiknadze Davit Satseradze Manana Moipurishvili Zurab Modebadze Gocha Zedginidze Kakhaber Gudiashvili Zaza Buachidze
Current events in the world had a significant impact on the increase in the volume of Georgian railway freight transportation. Therefore, the efficiency of utilizing the railway systems, monitoring the state of its operational processes and technical equipment has a significant impact on the smooth and uninterrupted process of transportation. Taking into account the indicators such as speed, reliability and quality of shipments. Railway transportation is developing progressively all over the world, and its efficient management is clearly one of the priorities of our country. An important component for the identification and management of freight wagons is the Arabic numerals printed on them, which determines the main characteristics and ownership of the wagon. According to internationally recognized agreements, foreign wagons, as well as freight wagons owned (or temporarily used) by railway administrations, must be immediately returned to the country of dispatch. From the first 24 hours of border crossing, "inventory" freight wagons are charged an average of 20 Swiss francs per day, while owned wagons have an average daily rental fee of US$30. The mentioned circumstance is one of the important problems along with the management of the rolling stock. At present, hundreds of railway employees are involved in order to identify the rolling stock in our country. Railway workers have who walk in the stations alongside the parked rolling stock and after the visual recognition of the number of the freight car, dictate the number through transmitters to the relevant operators of the station, who initially manually register them in special journals and then entering the data into a unified electronic system used for registry. Therefore, the railway freight shipments require significant human and time resources. In addition, the probability of making a mistake is also high. The mentioned situation significantly delays the speed of railway service and makes the service more expensive.				

26	"Optimal network arrangement of water pumping stations for underground irrigation". (PV (photoelectric) pump). . Austria	2024-2027	Omar Shamanadze	Marina Kurdadze Shalva is a week Mariam Janelidze Konstantine Megrelishvili
The implementation of the project aims at the following: development of an automatic remote control system, implementation and testing, which takes into account the optimal combination of irrigation areas in agricultural zones, the location of the optimal network of solar water systems (SWPS), the optimal placement of water reservoirs in agricultural zones. This need is related to the SWPS network, capacity of each reservoir, effective specifications of irrigation water pipes, soil moisture management of irrigated areas, regular data supply through telecommunication network, security storage and circulation usage.				