

List of projects that received funding under the 10<sup>th</sup> competition for financing project-based-learning - PBL (Excellence Initiative Program - Research University) winter semester academic year 2023/2024

No	Project name
1.	Reactive eutectic mixtures in sustainable chemical synthesis
2.	Development of polymeric carriers of cytotoxic compounds in combination therapy for glioblastoma multiforme
3.	Numerical study of the impact of seismic activity on foundations and earth structures in the context of the properties of near-surface layers of soil and the rock mass and features of underground tremors
4.	Optimization of cockpit interfaces to improve the safety of air operations, based on the principles of the ICAO SHELL Model, with particular emphasis on working in highly stressful conditions
5.	Figures with typhlographic marking - design and implementation of chess for visually impaired people
6.	Synthesis, study of properties and numerical modelling of piezoelectric polymeric materials aimed towards assessing the possibility of application in the process of tissue regeneration
7.	Incubator for plants and fungi simulating extreme environmental conditions
8.	Analysis of the distribution of natural activity and its effect on the dose rate of ionizing radiation in quartz grains of aeolian sediments in the context of the OSL dating method
9.	Design of the mechatronic end of the Universal UR10e robot for upper limb rehabilitation
10.	Development of sliding composite materials made of liquid photopolymer resins in 3D SLA printing
11.	Research and assessment of the possibility of using waste from sewage treatment plants to create a soil substrate and its use in the reclamation of degraded areas
12.	Measurement and visualization of muscle activity in the human body
13.	Application of innovative catalytic systems in industrial processes of oxidation of alkyl aromatic hydrocarbons
14.	Investigations of electrochemical corrosion properties of zinc coatings obtained in baths with the addition of Bi and Sn
15.	Analysis of structural changes in the brain under the influence of external factors and related to the presence of neurodegenerative diseases
16.	Design and implementation of an automatic warning system and protection against overflow of a water flow reactor model
17.	Numerical modelling of the stress state of a steel structure under the influence of a zinc bath

<b>18.</b>	Analysis of the activity of BK ion channels in the presence of metabolically and endocrine active compounds
<b>19.</b>	Computer simulation of the load on the hip joint
<b>20.</b>	Construction of a microwave sintering station for lunar and Martian regolith simulators
<b>21.</b>	An interactive station for identifying selected non-metals and their minerals in augmented reality.
<b>22.</b>	An innovative method of processing used electrolyte from car batteries
<b>23.</b>	Optimization of the power supply system with a hydrogen cell for the AGV
<b>24.</b>	Experimental analysis of the possibility of using a polymer transducer based on silver nanowires in medical applications
<b>25.</b>	Shaping renewable energy installations in modern zero-emission buildings and industrial plants
<b>26.</b>	Research and assessment of the possibility of using waste glass as a replacement for part of cement and fine aggregate for the production of concrete
<b>27.</b>	Practical use of artificial intelligence elements in mechatronics, including OpenAI and Bard Google tools
<b>28.</b>	A system for monitoring state borders using an unmanned aerial vehicle, thermal imaging and artificial intelligence algorithms
<b>29.</b>	Influence of the spraying technique and the number of layers on the state of stress in coatings made of remeltable alloys of the Ni-Cr-Si-B type
<b>30.</b>	The use of deep eutectic liquids in oxidation processes of application importance
<b>31.</b>	Plastic waste as a source of microplastics
<b>32.</b>	Development of the AZ91 magnesium alloy bonding technology
<b>33.</b>	Autonomous cooling system using thermoelectric materials
<b>34.</b>	Identification of a fragment of a meteorite using advanced materials testing methods
<b>35.</b>	Development of a reconnaissance drone cooperating with the Phoenix III rover
<b>36.</b>	Development of a procedure for the determination of selected hormones in environmental waters
<b>37.</b>	Construction of a measuring and analysis station for various types of thermo-reflective paints
<b>38.</b>	Numerical analysis of the influence of working conditions on the steering system elements in a passenger car
<b>39.</b>	Designing new magnesium alloys for die casting with enhanced plastic properties
<b>40.</b>	Experimental and bioinformatics validation of the cellular response to stress in CRISPR/Cas9 mutants of the GPX4 gene
<b>41.</b>	Design and printing of moulds, in particular of plaster, to produce architectural details from ceramic slips
<b>42.</b>	Green chemistry laboratory - waste-free recycling of organic solvents used in preparative column chromatography
<b>43.</b>	A model of a fibre optic network in the FTTx architecture
<b>44.</b>	Maximizing the speed of 3D printing in FFF / FDM technology by using a prototype design solution for extruder knurling drive
<b>45.</b>	Microplastics in pool water

46.	Construction of a station protecting against laser radiation
47.	The use of machine learning to analyse the causes of communication events to improve transport safety
48.	Development and implementation of a model of a semi-autonomous mobile platform of a device for collecting and transporting samples for testing concentrations of selected microorganisms in the air of hard-to-reach confined spaces
49.	Infrared absorption spectroscopy in photonic gas sensing applications
50.	Research on the development of an automated laser welding technology for lithium-ion cells of electric vehicle batteries
51.	The influence of geopolymer components as a material used in extraterrestrial construction on its strength in reduced pressure conditions
52.	Conductive polymers as semiconductor materials for organic solar cells
53.	The use of GIS IT tools to identify critical infrastructure in order to develop useful web maps
54.	Determination of current-voltage characteristics of colour BIPV modules based on experimental tests
55.	Qualitative research of open areas at the Silesian University of Technology in terms of architectural accessibility. Catalog of good practices in the field of universal design within POB 4: Smart cities and mobility of the future
56.	Launching a device for testing abrasion and scratch resistance using 3D printer elements
57.	Advanced methods of oxidation as methods of degradation of synthetic dyes
58.	Development of a comprehensive assessment of the porosity of large-size aluminium alloy die castings on the example of battery housings for electric cars
59.	Design and construction of a prototype device for fatigue testing of polymeric materials
60.	Design and implementation of a matrix reflecting the geometry of fittings produced by positive thermoforming
61.	Research on the removal of phosphorus(V) from fresh and sea water using biopolymer materials
62.	Construction of a gas microturbine model in 3D printing technology
63.	Evaluation of the possibility of using bacteria in the production of "green plastic" components from the water waste fraction from the thermal conversion of biomass waste
64.	Modern propeller systems with low noise emissions
65.	Personalized sensory accessories for children with disabilities produced with 3D printing technology
66.	Comparative analysis of the structure of structural wood and chemically and thermo-mechanically modified densified wood
67.	Development of a microsystem for encapsulating bio samples based on a microfluidic system
68.	Development of a new method of powder consolidation using the Gleeble simulator
69.	Preparation of application samples of poly(vinyl chloride) plasticized with bis(isononyl) terephthalate and bis(isodecyl) terephthalate
70.	Research on the processes of isolation and functionalization of carbon nanotubes using conjugated polymers or surfactants in order to obtain new materials for photonics, microelectronics and nanomedicine

<b>71.</b>	Development of a material for 3D printing that ensures spontaneous temperature reduction
<b>72.</b>	Obtaining testing samples from melliferous plants and herbs for the secretion of compounds responsible for antioxidant and antimicrobial properties as potential food packaging additives
<b>73.</b>	Structural changes in the surface layer of tool steel after laser treatment
<b>74.</b>	Modulation of angiogenesis processes on biodegradable polymeric materials intended for the treatment of chronic wounds
<b>75.</b>	Design, topological optimization of the carrying system, and construction of a prototype of a "rainbow follower" mobile robot for carrying loads
<b>76.</b>	A simulator of real electricity flows with an energy guard in the building's electrical installation
<b>77.</b>	Development of a simplified simulator of a nuclear power plant with a BWRX-300 reactor for didactic purposes
<b>78.</b>	Influence of the vehicle's electric drive on the effectiveness of the braking system
<b>79.</b>	Development and construction of a Personalized Environmental Control System (PECS)
<b>80.</b>	Design and execution of artistic graphics in the form of metal embossed "coins", for all Faculties of the Silesian University of Technology with individual graphic elements aimed at popularizing individual scientific disciplines in the academic and social environment
<b>81.</b>	Assessment of the possibility of homogenizing the microstructure of high-entropic alloys in heat treatment processes
<b>82.</b>	Research and analysis of a system for wireless transmission of electricity along with reduced models of selected systems
<b>83.</b>	Development of the LMD surfacing technology and assessment of the properties of surface layers produced on elements of mining tools in the oil and gas sector
<b>84.</b>	Stand for assessing the producibility of polymer resins used in composites produced by the contact and infusion method and assessing the durability of the composite's surface layer
<b>85.</b>	Designing and 3D printing of anatomical models helpful in preparing for surgery and explaining the treatment process to patients
<b>86.</b>	Evaluation of the possibility of using Peltier cells to produce electricity from process heat in a foundry
<b>87.</b>	Optimization of the auxiliary elements of the aerodynamic package of the Formula Student class car
<b>88.</b>	Expansion of the railway simulator with elements of mechatronics of control, communication and safety systems
<b>89.</b>	Production of biopolymers and their biological evaluation
<b>90.</b>	Design and construction of a wind microturbine dedicated to street lighting
<b>91.</b>	Construction of an electronic meter of the primary magnetization curve using the commutation method
<b>92.</b>	Dedicated software for the calculation of selected physicochemical parameters in the analysis of polymers
<b>93.</b>	Optimization of pathomorphological diagnostics process for oncological purposes
<b>94.</b>	A project of integrated solutions for the educational purpose of the Epson robot, combining electrical, pneumatic and vision technologies
<b>95.</b>	Production of components using the 3D technique from recycled materials
<b>96.</b>	Multi-purpose autonomous walking platform

<b>97.</b>	Development of personalized stabilizers and orthopaedic insoles using 3D printing technology
<b>98.</b>	Light and durable light aircraft hangar for the time of a volcanic eruption
<b>99.</b>	Research on the impact of the human factor on road safety in a tunnel using a car simulator
<b>100.</b>	Possibilities of using selected fungi in construction - creating building or finishing materials from waste materials as an element of shaping new biodegradable architectural forms
<b>101.</b>	The project of automation of the stand for the study of two-phase flow in the Ronque-Hilsch phenomenon
<b>102.</b>	Forming the structure and properties of alloyed copper as a result of plastic deformation
<b>103.</b>	Expansion of the tribological test station along with the development of software for data analysis
<b>104.</b>	Design and aerodynamic analysis of Silesian Greenpower car body elements
<b>105.</b>	Creation of software for designing the chemical composition of A2B2O7 compounds with ultra-low thermal conductivity based on Wright descriptors
<b>106.</b>	Can you win a life in the stock market? The use of stock market indicators in the early diagnosis of Parkinson's disease
<b>107.</b>	The concept of a treatment plant as a biorefinery - recovery of nitrogen and phosphorus nutrients
<b>108.</b>	A system for sorting stationary objects using a robot using a vision system
<b>109.</b>	Analysis of the production efficiency of bifacial modules with a positioning system
<b>110.</b>	Research on the possibilities of generating unambiguous control signals using hand gestures
<b>111.</b>	Optimization of the welding process using the Gleeble 3800 simulator of dissimilar materials produced with the SLM technology
<b>112.</b>	Design and construction of a heat storage based on phase change material, dedicated to heating domestic hot water
<b>113.</b>	Characteristics and preparation of biodegradable films filled with lignin nanoparticles
<b>114.</b>	Design of a vision system and a radar system for the AGV mobile platform
<b>115.</b>	The use of a laser beam in the production of three-dimensional objects
<b>116.</b>	The use of a silkworm waste cocoon for the adsorption of micropollutants from rainwater
<b>117.</b>	Analysis of the influence of technological parameters of laser cutting of steel on surface quality
<b>118.</b>	Construction of the uncertainty budget and analysis of detection limits in the uDOSE+ system
<b>119.</b>	Analysis of gene and miRNA expression in irradiated cells
<b>120.</b>	Determination of the characteristics $\lambda(T)$ of the moulding clay in order to optimize the process of manufacturing a sandwich casting
<b>121.</b>	The importance of fungi in the biotransformation of low molecular weight organic compounds present in the water fraction of waste from thermal conversion of biomass and plastics
<b>122.</b>	Experimental verification of the role of selected miRNAs in the regulation of aquaporin expression
<b>123.</b>	Development of a project of a thermal imaging camera for material science research

<b>124.</b>	Architectural accessibility audit - methods and tools. Research and science project under POB 4
<b>125.</b>	Determination of carbon sources in atmospheric dust using the radiocarbon method
<b>126.</b>	Improvement of the functional properties of the surface layer of tool steels after laser treatment
<b>127.</b>	Implementation of a device producing filament from recycled materials for 3D printers
<b>128.</b>	The use of industry 4.0 solutions to optimize environmental parameters in a saltwater aquarium
<b>129.</b>	Analysis of energy efficiency of a system for freezing food products using the vacuum method with a cold store
<b>130.</b>	Good practices in the field of architectural accessibility in the facilities of the Silesian University of Technology. Presentation of corrective actions in the field of universal design as part of POB 4
<b>131.</b>	Development of a system that improves the quality of the internal environment in the computer room
<b>132.</b>	The use of a laser radiation source in the process of producing unique coatings with increased wear resistance
<b>133.</b>	Dendrochronological and radiocarbon dating of the medieval settlement in Kozięłowy - continuation
<b>134.</b>	An innovative method of ethanol dehydration using composite polymer membranes containing doped selenium compounds
<b>135.</b>	An intelligent charging system for lithium-ion battery packs for walking robots and AGVs
<b>136.</b>	Heterojunction transistor based on zinc oxide and fullerenes as a sensor of volatile organic compounds
<b>137.</b>	Cell colony life support system needed to conduct a stratospheric balloon mission to study the effects of extreme conditions on biological material
<b>138.</b>	Selection of conditions for additive production of openwork technical ceramics
<b>139.</b>	Research on selected properties of materials and photovoltaic cells affecting their efficiency
<b>140.</b>	Design and construction of a compact low-pressure casting machine
<b>141.</b>	Preparation of activated carbon from carbonizates produced by pyrolysis of wood-based waste
<b>142.</b>	Influence of sample storage conditions on the stability of estrogens present in environmental waters
<b>143.</b>	Characteristics of selected pollutants of anthropogenic origin in the ecosystem of fish from natural water reservoirs
<b>144.</b>	Construction of a measuring station for testing the characteristics of wind turbines and acquisition of measurement data
<b>145.</b>	Determination of substitute thermal properties of materials created with the use of 3D printing technology
<b>146.</b>	Preparation, characterization and application of coatings of cellulose derivatives with sand filling as a protective layer of paper
<b>147.</b>	Analysis of the influence of organic fillers on the properties of selected polymeric materials
<b>148.</b>	Research on the progress of corrosion of the reinforcement of prestressed concrete beams under the conditions of simulating the changing impact of the climate
<b>149.</b>	The use of microcomputers in the control of biosynthesis parameters of polyhydroxyalkanoates
<b>150.</b>	Designing and developing a manufacturing technology for the construction of a specialized table for assembling power tools
<b>151.</b>	Modernization of the construction of the device for grinding thermoplastic polymer materials

<b>152.</b>	Research on the possibility of using basalt rocks in the process of creating a lunar regolith simulator as a material used in extraterrestrial construction
<b>153.</b>	Mounting the engines in the hubs of the front axle of the Formula Student car
<b>154.</b>	Design of a holder for testing AFO/DAFO orthoses intended for children with lower limb dysfunctions
<b>155.</b>	Improvement of consumption values of tap water
<b>156.</b>	High impedance power supply between input and output circuits
<b>157.</b>	Medium power transconductance amplifier
<b>158.</b>	Dye sensitization of a titanium dioxide layer for photovoltaic applications
<b>159.</b>	Multifunctional, light and durable city furniture as a showcase of smart cities of the Upper Silesian - Zagłębie Metropolis
<b>160.</b>	LCA analysis of aluminium pistons used in the automotive industry
<b>161.</b>	Methodology of measurements of products of metabolism and growth of bacteria depending on the conditions of their immobilization
<b>162.</b>	Recognition of sincerity of a smile using Machine Learning Algorithms
<b>163.</b>	A system that analyses and processes information about the temperature of tires in order to increase the level of safety and reduce energy losses in a Formula Student class car
<b>164.</b>	Principles of reverse engineering in artistic casting on the example of "Sleeping Lion" by Teodor Kalide
<b>165.</b>	Evaluation of the possibility of using manual laser beam welding in the automotive industry
<b>166.</b>	The use of 3D printing and reverse engineering techniques in the prototyping process of an innovative torsionally flexible articulated cardan shaft
<b>167.</b>	The use of the NORAXON myoMotion system in the application of the 5S methodology to assess the effectiveness of assembly operations
<b>168.</b>	Design and implementation of a computer-controlled numerical device for the production of printed circuit boards
<b>169.</b>	Experimental and numerical studies of an innovative check valve without moving parts with a hydraulic damping function using the Tesla valve design concept
<b>170.</b>	Research on the impact of the design of wind turbine rotors with a horizontal axis on the use of wind energy
<b>171.</b>	Damascus steel heat treatment in theory and practice
<b>172.</b>	Development of a blockchain network simulation environment for detecting anomalies in transactional data
<b>173.</b>	Energy analysis of a climate-neutral building
<b>174.</b>	Analysis of selected properties of filaments with the addition of graphene
<b>175.</b>	Kinetics of phosphate(V) sorption and desorption on chitosan hydrogels modified with transition metal ions
<b>176.</b>	Development of a technological concept for nickel recovery from waste
<b>177.</b>	Experimental identification of the failure mechanism of safety pins in clutches using FEM techniques and scanning electron microscopy (SEM)
<b>178.</b>	Observation of traces of ionizing radiation particles in the natural human environment

<b>179.</b>	The use of laser scanning for the inventory of a post-industrial facility in order to adapt it for tourist purposes
<b>180.</b>	Analysis of the quality of gel preparations used in electroencephalography: Evaluation of the influence of various gels on the quality of EEG signals
<b>181.</b>	Automatic Synthetic Music Generation using Machine Learning Techniques based on User Descriptions
<b>182.</b>	Design and strength analysis of hubs with a system for reading data from the driving system of the SW-05e car
<b>183.</b>	Design, construction and testing of a station for measuring the parameters of antennas for 4G and 5G systems
<b>184.</b>	Development of the "green walls" system with the function of active indoor air purification
<b>185.</b>	Hybrid sorbents based on chitosan for separating ions with similar physical and chemical properties
<b>186.</b>	Methodology of testing surface layers in the micro and nano scale
<b>187.</b>	Design and construction of a device for granulating waste from the 3D printing process
<b>188.</b>	The use of the command line for verification, security management of computer systems and the analysis of the possibility of using biometric data in encryption processes
<b>189.</b>	Mechatronic showcase for the presentation of mineral fluorescence
<b>190.</b>	Characteristics of the process of creating fractals from conductive polymers
<b>191.</b>	Designing and manufacturing a biodegradable, reconnaissance signet ring with an adjustable shape, used during mass events
<b>192.</b>	Immobilization of AcmB from a crude enzyme preparation
<b>193.</b>	Corrosion resistance of zinc coatings produced by electrolytic method on structural steel
<b>194.</b>	PLC MTH - development of a multi-core logic controller system and methods of multi-context implementation of the control program using the RP2040 microprocessor
<b>195.</b>	A system for detecting phases in the breathing process based on changes in the phase shift of the electromagnetic wave
<b>196.</b>	Assessment of the risk of sinkholes on a selected example
<b>197.</b>	A project to reduce the costs of ventilation of the mine ventilation network, taking into account work safety
<b>198.</b>	Experimental studies of photovoltaic systems excited by radioluminescence
<b>199.</b>	Development of a numerical map of mining excavations
<b>200.</b>	Modern technological solutions as data sources for Geographic Information Systems