SURE5.0 PROJECT – EXPRESSION OF INTEREST FOR SERVICE PROVIDER

RESEARCH&DEVELOPMENT&INNOVATION CONSORTIUM at SOFIA TECH PARK – MICRO NANO LABORATORY (MINOLAB), ARTIFICIAL INTELLIGENCE AND CAD SYSTEMS LABORATORY, INTELLIGENT COMMUNICATION INFRASTRUCTURES LABORATORY, 3D CREATIVITY AND NEW PRODUCTS RAPID PROTOTYPING LAB (3DCLAB)

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Prior participation in European projects:

MINOLab partners in:

- 4 projects for grants BG16RFOP002-1.005 "Development of product and manufacturing innovations" of Operational Programme "Innovation and Competitiveness" 2014-2020
- Extensive cooperation with the Technology Transfer Unit within the EU Joint Research Centre (JRC)
- Cooperation with the companies from the Cluster of Microelectronics and Industrial Electronics Systems and companies from the industries of microelectronics, nanoelectronics, industrial electronics, automotive, etc.

INTELLIGENT COMMUNICATION INFRASTRUCTURES LAB:

- Project "Integrated platform for construction, maintenance and management of systems of the type "smart cities" and "smart homes", OP "Innovation and Competitiveness" 2014-2020. Procedure BG16RFOP002-1.005: "Development of product and production innovations";
- Project "Monitoring and analysis of interference and spectrum occupancy in ISM-bands for the implementation of reliable IoT applications". № D-098-2019 / 02.10.2019. (2019 – 2020);
- Project MOTOR5G. No. 861219. H2020-MSCA-ITN-2019. (2020 – 2023) - The MOTOR5G research aims to efficiently design a Future Wireless Network (FWN) that shall provide diversified services such as enhanced mobile broadband access, ultra-reliable low-latency communications, and massive machine-type communications;
- Project RECOMBINE. No. 872857. H2020-MSCA-RISE-2019. (2020 – 2023)- Future wireless networks (FWNs) will need to efficiently and flexibly provide diversified services such as ultra-reliable low-latency communications, and massive machine-type communications.

ARTIFICIAL INTELLIGENCE AND CAD SYSTEMS LABORATORY

PROJECTS:

- AI and CAD System Lab partners in a project for setting up a network in robotics through Digital Innovation Hubs (DIHs), Grant Agreement № 824964 "DIH2 – A Network of Robotics DIHs for Agile Production" under Horizon 2020 Call H2020-DT-2018-2020/H2020-DT-2018-1. Leading partner is VTT Technical Research Centre of Finland Ltd.

- Carrying out research activities in the field of “NEUROMARKETING”
- Performing trainings of children in the field of robotics with utilization of the Lego Mindstorms platform
- Carrying out research activities in the field of “ARTHERAPY”
- Carrying out research activities in the field of “Artificial intelligence in smart electric grids”
- Carrying out research activities in the field of “Development of an expert system with artificial intelligence for automated diagnosis of diseases based on image diagnostics”
- Direct Baxter robot control with use of image data from Microsoft Kinect as input device.
- EEG and P300 signal recognition for letter and number recognition.
- Capturing and digitizing objects with drones.

3DCLab partners in:

- Ongoing projects for grants D-017-2022 with topic “Development and research in a relevant environment of a series of ecological products ECO-ZeoCup” of National Innovation Fund session 12
- Cooperation with the companies from the Automotive Cluster and companies from the industries of injection molding, tool shops, industrial engineering, automotive, industrial robotics etc.
- Collaboration with the Technical University of Sofia with regards to diploma projects and theses, PhD dissertations, and R&D projects
- Completed project with topic “3D printing with Post Industrial Recyclable Material (3DPIRM)”, Contract D-057-2018/20.06.2018.
- Virtual welding seam tracker – VSEAMTRACK under DIH4AI Project funded from the European Union’s Horizon 2020 research and innovation programme under grant agreement N. 101017057
- Realization of the priorities set in the National Roadmap of Research Infrastructures.
- Reinforcing the cooperation with universities from Bulgaria, Europe and world-wide.

Experiences and Qualifications

The R&D&I Consortium is a science and research organization. Members of the Consortium are: Sofia Tech Park JSC (which acts as an administrative and coordination unit of the activities), Sofia University “St. Kliment Ohridski”, Technical University of Sofia, Joint Genomic Center. It operates a Laboratory complex of 11 high-tech laboratories, designed to perform problem-driven and industry-oriented R&D directed to efficient, value-added and environmentally-friendly utilization of the national bio-resources. All of them are furnished with state-of-the-art equipment and conduct fundamental and applied research, providing scientific services to private companies and organisations. The main objective is to foster science for industrial applicability and facilitate the development of the next level economy.

For the SURE5.0 Service Provider Call we apply with the following Labs:

Micro Nano Lab - MINOLab’s mission is to setup, maintain and develop applied and innovative research, testing, analysis, design and prototyping for printed circuit boards (PCBs), micro- and nanoelectronics with an accent on electromagnetic compatibility, RFID, MEMS, and biomedical applications. The goal is to solve problems originating from real world applications in electronics, microelectronics and nanoelectronics, development hi-tech as well as affordable methods and tools for design, modelling and testing. At MINOLab we deliver services for root cause analysis of failures and defects in electronic devices. We also provide research and development (R&D) and optimization of novel devices, products and systems.

Main activities:

- Early detection and analysis of failures in micro- and nanoelements, devices, modules, systems, prototypes
- Measurements and characterization of integrated circuits and systems, PCBs and devices
- Design at circuit and component level, prototyping
- Development and testing of devices at circuit and system level including embedded systems
- Training in electrical engineering, micro- and nanoelectronics for company employees, students, experts, etc.

The Intelligent Communication Infrastructures Laboratory specializes in research and development activities, to perform measurements and testing in the areas of railway traffic management and security systems (trains, trams and metro), 5G communications and the Internet of Things (IoT). The laboratory is equipped with the main technological solutions for testing specific products and systems in the field of railway transport, as well as specific equipment and software for research in the field of 5G communications and for LoRaWAN, IoT and M2M applications.

The Artificial Intelligence And CAD Systems Laboratory - Developing a suitable simulator of human brain activity, as well as the relevant information and computer technologies that promote and guarantee its activity.

Scientific research and developments in the following areas: intelligent systems for medical applications, algorithms for controlling robots and drones, intelligent systems for early warning of natural disasters and intelligent systems for the recognition and certification of materials and products.

Use of CAD systems in the field of microelectronics, telecommunications and intelligent transportation; design and modelling of new devices, systems and technologies, as well as design and modelling of sea vessels.

Computer design of complex systems for industry, business, etc.

The 3D Creativity and New Products Rapid Prototyping Lab – its main objective is to develop a research capacity for the application of innovative technologies for materialization of virtual 3D models with complex forms in a very short time. This lab's mission is to create innovative practices and to build unique and accessible opportunities for research and development in the field of 3D creativity through systems for quick physical manifestation of new ideas and products in order to shorten the time to market.

Main activities:

- Consultation on 3D modelling, rapid prototyping technologies and parts production;
- 3D modelling and design of parts, assemblies and products;
- 3D scanning;
- Comparative analysis between physical and computer models;
- High precise metrology;
- Manufacturing of metal parts;
- Manufacturing of plastic parts;
- Production of casting equipment and 3D printing;
- Validation of functionality of a mold told (metrology, geometry deviation, mutual disposition), wearing identification
- Manufacturing and repairing of mold tools.

Capacity to deliver services in a cross-border manner

All the services will be provided in English. There will be no problem for online communication, since we have the necessary equipment. The researchers have participated in many international projects, and have provided services to different kinds of companies. Sofia Tech Park and its lab complex is one of the best state-of-the-art research centers in the Balkan Region. More information on the laboratories and their activities could be found here: https://sofiatech.bg/en/about-us/rdi-consortium/

Team available

Prof. Vladimir Poulkov, PhD, has many years of teaching and research experience in the field of telecommunications. He has specialized in Germany, Denmark and Greece and is author of many scientific publications. He has led numerous industrial and engineering projects related to the development of the telecommunications network in Bulgaria, as well as a number of national and international research and educational projects. He is Vice Chairman of the General Assembly of the European Telecommunications Standards Institute (ETSI), Chairman of the Bulgarian Cluster for Digital Transformation and Innovation.

Prof. George Todorov, TU – Sofia - Scientific fields: CAD/CAM/CAE technologies, Rapid prototyping and Rapid tooling. His role will be developing of quality control, efficiency and test procedures in Hybrid manufacturing on both stages additive and subtractive.

Prof. George Angelov PHD, TU – Sofia - Areas of expertise: modelling of semiconductor devices, design of integrated circuits and printed circuit boards, advanced materials, bioelectronics, renewable energy sources, electromobility; George Angelov is Master in Physics from Sofia University “St. Kliment Ohridski” (1999). Specialization in “Business Management, Japan (2001). PhD in Microelectronics from the Technical University of Sofia with topic of modeling submicron semiconductor devices (2008).

Associate Professor (2013-2021) and Professor (2022) at the Department of Microelectronics at the Technical University of Sofia; Chair of the Department (2015). Chairman of the Managing Board of the Cluster of Microelectronics and Industrial Electronics Systems (2016).

His research and project activities are in micro- and nanoelectronics, integrated circuit design and technologies, sensor and MEMS applications, bioelectronic devices, advances materials, etc. Author of more than 110 research papers. Participated in more than 30 successfully completed projects in micro- and nanoelectronics and their applications in the industry.

Assoc. Prof., PhD Radoslav Iliev Miltchev - TU – Sofia, Faculty of Industrial Technology (FIT), department Technology of Mechanisms and Machines , Laboratory Artificial Intelligence and CAD Systems; Areas of expertise: Technical Sciences - Electrical Engineering, Electronics & Automation: Neural Networks, Information Security, Computer Networks, Cloud Technologies, CAD/CAM/CAE, Numerical Methods

Services description

MINOLab could provide FA (Failure Analysis) of ICs and PCB. In particular, SAM (Scanning Acoustic Micrsocopy), EMMI (emission microscopy), plasmadecapsulation, X-Ray Analaysis, EDX/XRF spectrometry, PCB prototyping (CNC) and SMT (Pick N Place) + electrical characterization and modeling.

EQUIPMENT available:

- XRF Spectrometer
- SAM microscope
- X-Ray Inspection System
- Shear stress Bondtester

- Ion milling and polishing machine
- Emission Microscope (EMMI)
- Plasma Decapsulator
- Curve Tracer
- Optical microscopes

The ARTIFICIAL INTELLIGENCE AND CAD SYSTEMS LABORATORY has the necessary capacity and develops scientific research, development and training activities in the following areas:

- Development of applications using artificial intelligence - for various areas of economic, social and public life, including for the purposes of industry, manufacturing, medicine, agriculture, forestry, ecology, cybersecurity and business. The solutions we offer integrate computer vision, neural networks for machine and deep learning, expert systems, natural language processing, and more.
- Design, development and use of embedded systems for artificial intelligence and manufacturing automation - solutions based on Arduino, Raspberry, Jetson, Microbit, STM32, ESP32 and others, communicating with cameras, sensors and different type of actuators.
- Development of algorithms for autonomous vehicles - integration of mechanisms and algorithms for environment detection and orientation, development of procedures for solving certain control tasks, integration of GIS and GPS technologies, use of ground and air based vehicles.
- Design and development of Industry 4.0 solutions - design and development of industrial automation solutions, integration of cybersecurity solutions for protection of industrial information systems, integration of artificial intelligence and robotic based solutions.
- CAD systems integration and reverse engineering - integration of CAD solutions for various sectors of the economy, reverse engineering for design, remanufacturing and production of specialized and/or unique parts.
- Smart City Solutions - artificial intelligence based solutions for traffic counting, tracking and control, IoT solutions, integration of communication technologies of various types.
- Intelligent solutions for forestry, agriculture and livestock breeding - design, development and integration of solutions based on artificial intelligence, IoT devices, robotic systems.
- Intelligent solutions for the study of sensory-motor, cognitive and emotional responses – medical and technical equipment and software for the study of stress, emotional states and perceptions, IoT solutions for biofeedback, developments in neuromarketing, neurobiology, psychology and behavioral economics.
- Educational programs, training and consulting - developing educational programs, conducting training, demonstrations and consulting in the areas of artificial intelligence, embedded systems, sensing, industrial communications, robotics, CAD/CAM/CAE systems, reverse engineering, drone usage and more.

The Intelligent Communication Infrastructures Laboratory

- The laboratory is accredited according to БДС EN ISO/IEC 17025:2018 – certificate of accreditation № 294 *ЛИ*/05.07.2022 and order of accreditation № А 416/05.07.2022, issued by Executive Agency Bulgarian Accreditation Service – for the balise testing.
- Analysis, research, design of subsystems of the telecommunication infrastructure of railway operators.
- Testing of on-board computers (European Vital Computer: EVC) and Eurobalises (Balize Transmission Module: BTM).

- Use of the Eurobalises and BTM test bends for carrying out R&D, tests and analisis of the operability of devices, functional tests, etc. – special testing according to SUBSET-085 и SUBSET-036;
- Expertise in the field of telecommunications networks and the Internet of Things.
- measurements in laboratory conditions of a general nature of electromagnetic parameters (time, frequency, energy, etc.) of radio frequency devices, appliances and systems in the frequency range up to 3 GHz and up to 12 GHz;
- analyses, expert assessments and opinions in the field of Electromagnetic compatibility;
- field measurements of electromagnetic fields, equipment parameters, etc.
- simulation of various modern communication networks by implementing test sites for systems such as WiFi, LoRa, Zig Bee, Bluetooth, etc.;
- analysis and synthesis of antennas and antenna systems;
- analysis and synthesis of ultra-high frequency devices and systems;
- analytical calculations of radio links and radio coverage, guaranteeing reliable communication;
- verification of compliance with standards for electromagnetic emissions and operation of radio frequency devices;
- development, verification and implementation of test procedures for verification and measurements of non-radiotechnical objects in their interaction with electromagnetic fields.

Laboratory for 3D Creativity and Rapid Prototyping offers services:

- In the field of Reverse Engineering by using a unique for Bulgaria 3D high-precision contact and non-contact measurement system and specialized software;
- Construction of conceptual, pre-series or unique products using 3D Printing (Low Volume Production) technology from polymer materials;
- Construction of conceptual, pre-production or unique products and construction of pre-production or industrial metal forming tools using Laser Additive & High Speed milling;
- EQUIPMENT available:
- Rapid prototyping hybrid system –metal additive technology and high speed milling. Work area for workpieces up to 650 mm in X, 735mm in Y, 560 mm high and weight 1000 kg.
- Sand and ceramic rapid prototyping additive system. Working space: 500 x 400 x 300 mm.
- 3D contact and contactless scanning system for reverse engineering and metrology purposes.
- Metrology system for complex 3D objects. Suitable for precise measurements, contact and non-contact optical and by laser. Working volume: 600 x 600 x 300 mm.

Time and duration of the envisioned services

We apply client-centric approach, and the time and duration of the services entirely depends on clients needs and projects.

Fee ranges

50-150 €/h – To be additionally negotiated with the clients according to the services and specific requirements

Service delivery mode (online, offline, hybrid)

Service delivery – online, offline, hybrid