



**R&D
SERVICES
CATALOGUE**



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Published as part of a project to prepare and develop a "New Offering of GMU Research and Implementation Services", Stage III - "Integration", Task 2 - "Research Integration".

A Grant entitled "Support for the University's consolidation process" was allocated as part of the Operational Programme Knowledge Education Development co-financed by the European Social Fund - application No POWR.03.04.00-00-P005/17/09, agreement No MEIN/2021/169/DIR/KON.

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GMU archive

Translation:

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Number and date of issue: 2/02-2023

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TABLE OF CONTENTS

1. GDYNIA MARITIME UNIVERSITY	4
2. GMU UNITS	6
3. R&D SERVICES - AREAS	9
• Environmental Research	10
• Electric Power Engineering Renewable Energy	16
• Transport Logistics Safety	20
• Mechanical Engineering Materials Engineering	26
• Management Information Technology Product Quality	32
4. OUR FLEET	36
5. OUR CUSTOMERS	38
6. TECHNOLOGY TRANSFER OFFICE	40



Gdynia Maritime University (GMU) offers a wide range of services to entities from within the socio-economic environment that are adapted to the challenges of modern science and the national and global economies. The University's academic staff comprises highly qualified scientific personnel with modern research laboratories at their disposal, guaranteeing research at the highest level.



MORE THAN 300
RESEARCHERS

APPROX. 150
LABORATORIES

ALMOST 80
CLIENTS

5 UNIVERSITY UNITS:
4 FACULTIES
AND
THE MARITIME
INSTITUTE

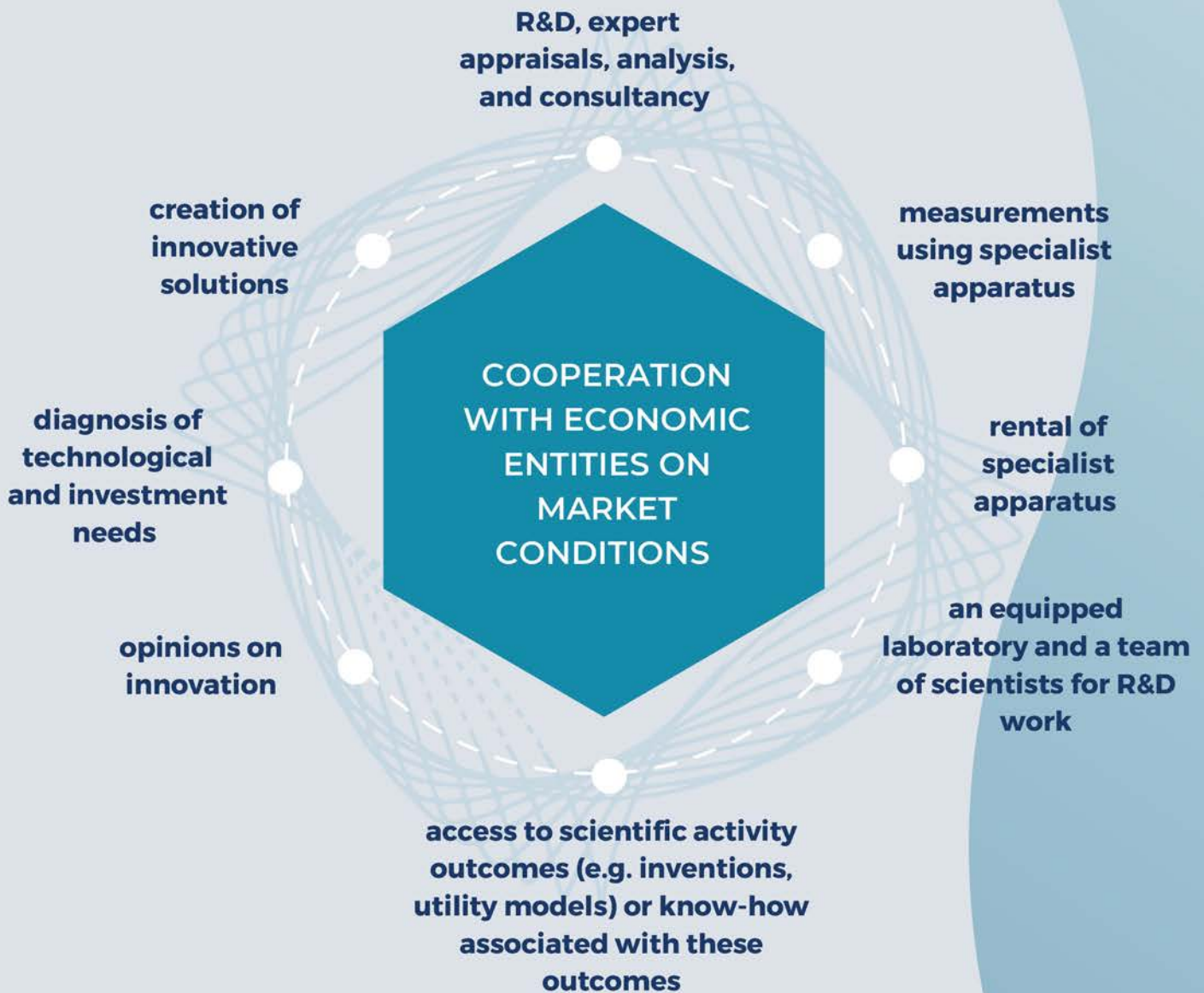
OVER 200
RESEARCH SERVICES

AWARDED
HR EXCELLENCE
IN RESEARCH

Our greatest asset is our flexible approach to conducting scientific research, R&D, and expert services, which allows us to provide bespoke services that meet the needs and expectations of businesses and economic organisations.

We guarantee all our clients:

- ✓ *an individual approach,*
- ✓ *a comprehensive administration service,*
- ✓ *an interdisciplinary team of scientists,*
- ✓ *the required research infrastructure.*



In cooperation with the entities of the socio-economic environment, GMU conducts R&D and implementation projects within the framework of national, European and international programmes.

We offer cooperation as:

✓ **a consortium leader or partner (consortium agreement)**

✓ **a sub-contractor as indicated in a project proposal**

GMU UNITS

FACULTY OF ELECTRICAL ENGINEERING

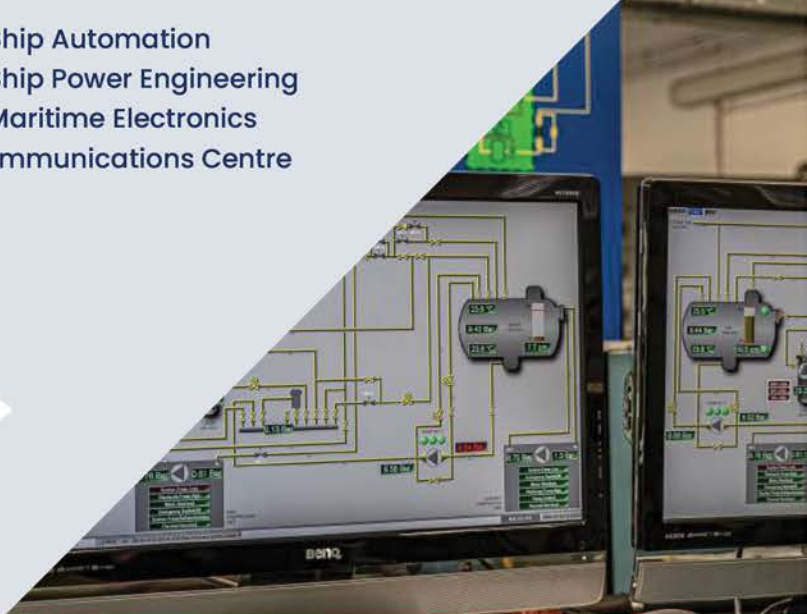


R&D services at the Faculty of Electrical Engineering are provided by qualified and experienced academic staff from:

- The Department of Ship Automation
- The Department of Ship Power Engineering
- The Department of Maritime Electronics
- The Maritime Telecommunications Centre

NUMBER OF DEPARTMENTS AND SECTIONS:
4

NUMBER OF RESEARCHERS:
74*



FACULTY OF MARINE ENGINEERING

R&D services at the Faculty of Marine Engineering are provided by qualified and experienced academic staff from:

- The Department of Physics
- The Department of Ship Materials and Overhaul Technology
- The Department of Ship Power Plants
- The Department of Engineering Science



NUMBER OF DEPARTMENTS:
4

NUMBER OF RESEARCHERS:
51*



FACULTY OF NAVIGATION

R&D services at the Faculty of Navigation are carried out by qualified and experienced academic staff from:

- The Department of Ship Operations
- The Department of Mathematics
- The Department of Navigation
- The Department of Transport and Logistics
- The Geodesy and Oceanography Section



NUMBER OF
DEPARTMENTS
AND
SECTIONS:
5

NUMBER OF
RESEARCHERS:
70*

FACULTY OF MANAGEMENT AND QUALITY SCIENCE

R&D services at the Faculty of Management and Quality Science are provided by qualified and experienced academic staff from:

- The Department of Logistics and Transport Systems
- The Department of Information Systems
- The Department of Industrial Product and Chemical Quality
- The Department of Quality Management
- The Department of Marketing and Quantum Methods
- The Management and Economics Section



NUMBER OF
DEPARTMENTS
AND
SECTIONS:
6

NUMBER OF
RESEARCHERS:
85*



MARITIME INSTITUTE

R&D services at the Maritime Institute are provided by qualified and experienced academic staff from:

- The Economics and Law Department
- The Operational Oceanography Department
- The Environmental Protection Department
- The Maritime Hydraulic Engineering Department
- The Water Ecology Department
- The Maritime Geotechnics Department
- The Maritime Electronics Workshop
- The Spatial Policy Workshop



NUMBER OF
DEPARTMENTS
AND
WORKSHOPS:
8

NUMBER OF
RESEARCHERS:
100*



GMU is currently building an **innovative centre of integrated research laboratories for the marine environment**, which aims to improve the quality and range of research conducted for the offshore industry. The GMU Centre for the Offshore Industry will be the headquarters of **the certified laboratories of the GMU Maritime Institute**, whose development is part of the preparation and realisation of investment in offshore wind power. An important advantage of the Centre is its direct access to the Wisloujście coastline, which will allow the University's training and research vessels, as well as the service ships of its contractors, to berth and carry out maintenance.

The Centre will carry out **comprehensive research and measurements to advance knowledge of the state of the marine environment** and its resources for the development of the fuel market, shipbuilding, offshore wind energy, and maritime transport. GMU is currently the only research and development unit in the country to be engaged in such work.



R&D SERVICES

AREAS

ENVIRONMENTAL RESEARCH

1

ELECTRIC POWER ENGINEERING | RENEWABLE ENERGY SOURCES

2

TRANSPORT | LOGISTICS | SAFETY

3

MECHANICAL ENGINEERING | MATERIAL ENGINEERING

4

MANAGEMENT | INFORMATION TECHNOLOGY | PRODUCT QUALITY

5



The provision of R&D services in Environmental Research aims to strengthen international competitiveness and increase the growth rate of industrial enterprises by monitoring their impact on the environment.



Services provided:

- *marine environment research using research vessels;*
- *maritime environment monitoring;*
- *environmental impact assessment;*
- *improvement of the safety and efficiency of transport and logistics services in ports.*



GMU's range of R&D services within the field of Environmental Research is aimed in particular at offshore companies, the maritime sector – mainly the shipbuilding and yacht building industries – and others such as the packaging and processing industries, maritime administration, and national and regional authorities.

The research offered as part of GMU's R&D services is in line with the first category of the Pomorskie Smart Specialisations (PSS):

- PSS1: Offshore and port and logistics technologies.

Comprehensive pre-investment research of the marine environment

- Research before the construction and operation of offshore facilities such as offshore wind power plants, submarine cable and pipe routes, sanitary collectors, artificial reefs, inventory of marine mineral deposits, and measurements of the degree of contamination and volume of dredging work.
- Assessment of the marine resources of renewable energy (wind energy, waves, currents).

TOOLS AND APPARATUS: reaserch vessels and GIS

#geographical data



Qualitative and quantitative research on the content of xenobiotics

- Research on the environmental impact of xenobiotics and assessment of their vulnerability to environmental degradation.
- A quantitative and qualitative analysis of organic pollutants to assess the degree of water pollution with xenobiotics as part of environmental management.

TOOLS AND APPARATUS: OxiTop, UV/VIS and GC-MS spectrophotometers

*#sewage
#leachates
#water samples*



Testing of the physical and chemical properties of water and sewage, including the collection of samples

- Quality testing of surface and groundwater as well as sewage in accordance with the accreditation standards of PCA laboratory no AB 646.
- Testing and a quantitative and qualitative balance of sewage in accordance with the accreditation standards of PCA laboratory no AB 646.

*#water samples
#sewage*



Analysis of eutrophication prevention methods

- Development of methods for the recovery of phosphorus from leachates and the removal of phosphorus compounds from sewage.

TOOLS AND APPARATUS: individual solutions developed to suit individual research conditions and material

*#sewage
#leachates*



Analysis of a circular economy

- Identification of circular economy indicators in the sewage treatment process.

**#circular
economy**



Monitoring marine species and habitats

- Monitoring marine species and habitats to assess the state of the natural environment.

**#phytobenthos
#zoobenthos
#phytoplankton
#zooplankton**



Testing of the (bio)degradation of polymer materials

- Research and assessment of susceptibility to (bio)degradation in natural (saltwater/freshwater) and laboratory conditions.

TOOLS AND
APPARATUS:

FTIR Spectrometer with ATR attachment,
metallographic microscope, differential scanning
calorimeter, durometer, hardness meter, weighing
scales with density marking, goniometer

**#polymer
materials**



Waste management analysis

- Management of composite waste according to the principles of sustainable development.
- Consulting in the field of industrial waste and demersal settlements.

**#waste
#demersal
settlements
#polyester-glass
recyclate**



Modelling of light transmission in the sea-atmosphere system

- Modelling of light transmission to predict changes in the remote signal recorded by satellites and detectors.

TOOLS AND APPARATUS: HydroLight with the Monte Carlo algorithm

*#atmosphere
#sea*



Spectrofluorimetric research

- Measurement of fluorescence and absorption to test an unidentified spectral signal.

ELECTRICAL APPARATUS: UV/VIS spectrophotometer and fluorometer

#liquids



Test of particle shape and size

- Testing of the shape and size of suspended particulate matter and dust to identify particles embedded in filters.

TOOLS AND APPARATUS: optical microscope

*#dusts
#powders
#suspended
particles*



Analysis of exhaust fumes

- Analysis of emissions of exhaust fumes into the atmosphere by measuring the content of gases and particulate matter they contain.

TOOLS AND APPARATUS: electrochemical gas analyser

*#exhaust
fumes from
internal
combustion
engines*



Analysis of methods for the protection of seashores

- Assessment of the natural and technical conditions of seashores.
- Modelling of the lithodynamic processes of coastal zones.
- Design methods for the protection of seashores and banks of floodplains.
- Artificial seashore and floodplain nourishment planning.

#seashores



Modelling of swell in waterways

- Modelling of swell in waterways to determine the conditions for investment in ports and marinas.

**#waterways
#swell**



Analysis of the flow of suspension in waterways

- Modelling the flow of suspension resulting from dredging and underwater work in ports and seaports.

**#bodies
of water
#suspension**



Assessment of the environmental impact of investments

- Consulting on the preparation and development of environmental documentation.
- Consulting on the development of a protection plan for areas of natural value.
- Consultancy in the field of water and sewage management.
- Environmental inspection.
- Assessment of the environmental impact of heavy-duty objects.

**#investments
and the
environment**



TOOLS AND
APPARATUS:

GIS tool kit, ArcGIS, Golden Software Surfer,
Golden Software Grapher

ACCREDITED LABORATORIES



ENVIRONMENTAL PROTECTION LABORATORY



AB 646

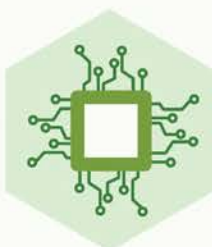
Testing Areas:

- Chemical testing, chemical analysis
- Physical property tests
- Sampling (laboratories accredited for sampling)

Objects of research:

- Objects and biological materials intended for testing
- Food
- Water
- Water for human consumption
- Sewage
- Soil, earth and rocks
- Sediments, waste

Accreditation: AB 646
Valid until: 31-08-2025
Valid from: 01-09-2005



MARITIME ELECTRONICS LABORATORY



AB 848

Areas of Research:

- Environmental Engineering (Environment and Climate)

Objects of research:

- Work environments (harmful and burdensome factors)
- General environment (physical factors)

Accreditation: AB 848
Valid until: 15-11-2023
Valid from: 16-11-2007



MARITIME GEOTECHNICS LABORATORY



AB 1770

Areas of Research:

- Mechanical testing, metallographic testing
- Physical property tests

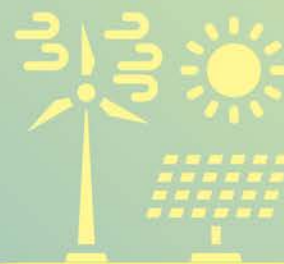
Objects of research:

- Products, materials, construction works
- Soil, earth, and rocks
- Sediments, waste

Accreditation: AB 1770
Valid until: 21-12-2024
Valid from: 22-12-2020



The primary aim of our R&D services in Electrical Power Engineering and Renewable Energy Sources is to increase the efficiency of the distribution, generation, processing and consumption of energy, extraction of raw materials, and processing of fuels.



The R&D services offered by GMU within the second area are aimed in particular at companies in the offshore industry and the widely understood industrial sector, including both marine and land-based industries.

Services provided:

- *measurement and analysis of the characteristics of electrical energy in power distribution systems;*
- *multimodal human-machine interfaces;*
- *improvement of energy efficiency in construction and industry;*
- *creation of renewable energy sources;*
- *services connected with energy storage methods;*
- *services connected with alternative propulsion methods.*



The proposed scope of research within the field of Electrical Power Engineering and Renewable Energy Sources is in line with the first three Pomorskie Smart Specialisations (PSS):

- **PSS1: Offshore and port and logistics technologies;**
- **PSS2: Interactive technologies in an information-saturated environment;**
- **PSS3: Ecoefficient technologies in the generation, transmission, distribution and consumption of energy and fuels, and in construction.**

*#efficient low-carbon energy #hydrogen technology
#Green Transformation*

Testing and assessment of the characteristics of electricity in electric power systems

- Measurement of voltage, current and power characteristics, including assessment of distortion.
- Measurement of the harmonic ratio in the current of power supply and power factor for selected power supply systems.
- Data analysis using original algorithms.

TOOLS AND APPARATUS:

original software | 48-channel signal recorder with input circuits | measuring devices | power supply systems

#electric power systems



Development of industrial process control algorithms

- Analysis of production process control algorithms.
- Development of algorithms for the control of industrial processes on land and sea.

TOOLS AND APPARATUS:

S7-300 and S7-1200 family programmable drivers | Profinet input/output modules | SFAR input/output modules operating in Modbus RTU standard | frequency changers | Profibus DP industrial network input/output modules | touch panels | STEP 7 software | WinCC TIA Portal

#Industrial processes



Design of control systems for converters

- Simulation studies on the development of control systems, control algorithms and mathematical tools.
- Design and construction of DC-DC converters and semiconductor light source components.

TOOLS AND APPARATUS:

software vibration measurement system | Cadence electronic system simulation software | DipTrace schematic and PCB design software, measuring devices and power supply systems | machinery for mechanical machining and prototyping

#converters



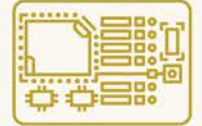
Design of components for converters

- Formulation of computer models of semiconductor components, power modules, chokes and transformers, semiconductor light source components, and DC-DC converters systems, while considering electrical, optical, magnetic and thermal phenomena.
- Measurement and computer simulations of static characteristics of semiconductor elements, magnetic elements, semiconductor light sources, DC-DC converters, and photovoltaic components, while considering thermal phenomena and systems containing these elements.

TOOLS AND APPARATUS:

Cadence electronic system simulation software | DipTrace schematic and PCB design software | measuring devices and power supply systems | mechanical machining and prototyping devices | an original system for measuring the thermal parameters of semiconductor components

#converters



Designing Power Systems for Industrial Equipment

- Design of chokes and transformers for DC-DC converters.
- Design and construction of efficient cooling systems for semiconductor components of electronic and electric power circuits.

TOOLS AND APPARATUS:

an original system for measuring semiconductor thermal parameters | DipTrace schematic and PCB design software | measuring devices and power supply systems | mechanical machining and prototyping equipment

#power supply systems



Semiconductor component testing

- Measurement and modelling of semiconductor light source components, lighting systems and DC-DC converters.
- Measurement of thermal parameters of semiconductor elements, power modules, chokes, and transformers and selected integrated circuits.
- Assessment of the effects of installation processes and thermal phenomena on the electrical, thermal and optical parameters of semiconductor components.

TOOLS AND APPARATUS:

an original system for measuring semiconductor thermal parameters | DipTrace schematic and PCB design software | measuring devices and power supply systems | mechanical machining and prototyping equipment

#semiconductors



Analysis of hydrogen production systems

- Analysis of "green" hydrogen production systems using electrolysis.

TOOLS AND APPARATUS:

Cadence electronic system simulation software | DipTrace schematic and PCB design software | measuring devices and power supply systems | mechanical machining and prototyping equipment | HG24 series electrolyser with SOFT-110 | 100W hydrogen fuel cell | hydrogen storage systems | including pressure reducers

*#fuels
of the future*



Testing of electromagnetic compatibility of radio communication systems

- Measurement of emissions of radiated disturbances and conductive disturbances, testing in a GTEM chamber and determination of mono and tri-phase resistance to conduction disturbances induced by radio frequency fields using magnetic field probes and antennae.

TOOLS AND APPARATUS:

an electromagnetic disturbances emission measurement station | conductive and radiated electromagnetic disturbances device | probe set | magnetic and electrical field antenna set | transmitter and receiver antenna set

*#radio-
communications*



Comprehensive design and implementation of industrial process control systems

- Design of control systems, oversight of their implementation, analysis of the quality of control and sensitivity to changes in the parameters of the object and the inaccuracies of measurement data in real operating conditions.

#processes



Diagnostics of electrical and rotating machines

- Testing of electrical machines and spinning machines using current or vibration methods.

*#electrical
machines
#spinning
machines*



The University's R&D services in Transport, Logistics and Safety aim at developing the services sector, in particular in relation to the maritime economy, to ensure modern mobility and safety. Our goal is to support companies in their transition to a more sustainable business model through the efficient use of resources, infrastructure and supply chains.

Services provided:

- *simulation testing services for intelligent control systems;*
- *ship traffic control research services;*
- *maritime water modelling services;*
- *planning and safety assessment of towing at sea;*
- *manoeuvre analysis and planning;*
- *services related to cargo securing methods and risk assessment for the transport of hazardous substances;*
- *improvements in the safety and efficiency of transport and logistics services in ports.*



The third area of R&D services offered by GMU caters in particular to companies from industry, both maritime and inland, transport, shipping, logistics, maritime administration, and national and regional authorities.

The proposed scope of research in Transport, Logistics and Safety is in line with the first three Pomorskie Intelligent Specialisations (PSS):

- **PSS1: Offshore and Port and Logistics Technologies;**
- **PSS2: Interactive technologies in an information-saturated environment;**
- **PSS3: Ecoefficient technologies in the generation, transmission, distribution and consumption of energy and fuels and in construction.**



#modern mobility #modern retail #digitisation of organisations



Development and analysis of vessel control systems

- Statistical and economic analysis of transport and logistics markets.
- Consulting on logistics service systems.
- Assessment of the plausibility of completing voyages within a certain time frame, and the long-term planning of voyages in polar regions.
- Marketing research on the transport market.
- Economic research in maritime transport.
- Legal and economic analysis of marine areas of particular sensitivity.

TOOLS AND
APPARATUS:

GIS system

*#transport
and logistics
markets*



Developing a transport strategy

- Consultancy on the preparation of transport strategies for regions and urban areas.

#urban mobility



Transport infrastructure management services

- Optimisation of management models for improving the management of ports and maritime terminals, and business models in the network services sector in the era of the development of digital supply chains and smart sustainable mobility.

#transport



Logistics support process improvement services

- Analysis and assessment of the reliability and readiness of technical systems.
- Development of a system to support the decision-making process and planning of the reliable operation of technical systems.
- Single and multi-criteria optimisation of systems, networks and processes
- Design of logistic control towers for the supervision and handling of economical and social logistics processes.

TOOLS AND
APPARATUS:

MATLAB and Simulink | PTV Group software |
Mathematica

#logistics



Ship mooring analysis

- Navigation analysis and simulation of mooring under different hydrometeorological conditions.

TOOLS AND APPARATUS:

IWRAP | navigation bridge simulators

#mooring system



Analysis of cargo lines and port service scheduling

- Analysis of cargo lines and port services.
- Analysis of modern transport and handling technology in the multimodal transport system.

#transhipment systems



Safety assessment of cargo transport

- Assessment of the risk associated with the transport of hazardous chemicals by sea based on an assessment of chemical properties and IMO classification.
- Modelling the consequences of critical infrastructure accidents, in particular those associated with the release of chemical substances.
- Research on the transport and technological properties of fixed bulk cargoes and analysis of the conditions necessary for their safe transport.

TOOLS AND APPARATUS:

Proctor apparatus | shock table

#cargoes



Analysis of shipping and maritime transport safety

- Assessment of the safety of transport of people and goods.
- Analysis of the navigational safety conditions of vessels, including the offshore sector.
- Assessment of the navigational risk of vessels, including the determination of optimal speeds.
- Expert appraisals on the impact of the IMF and a set of devices on the safety and efficiency of shipping.

TOOLS AND APPARATUS: 3D ship domain model software | navigation bridge simulators | DP simulators

#safety at sea



Digital security research in the maritime industry

- Identification and analysis of cyber security threats.
- Advice on documentation on the implementation of safety standards.

#cyber security



Marine accident analysis

- Expertise in determining the causes of accidents in maritime transport.

#accidents at sea



Advice on safety onboard ships

- Consulting on the implementation of quality systems and ship safety and security systems, including ISO 9001:2000 and ISO 14001/OHESIS 18001.
- Conduct internal and external audits on marine vessels on the implementation of ISO 9001:2000 and ISO 14001/OHESIS 18001.

#safety at sea



Maritime spatial planning

- Sustainable spatial planning and monitoring of marine and coastal areas.

TOOLS AND
APPARATUS:

GIS system

#marine areas



Measurements of electromagnetic fields of equipment and installations

- Assessment of health and safety at work in accordance with the accreditation standards of PCA laboratory no AB 848 to prevent the adverse effects of devices and installations on human health.

#devices and installations



Support for navigation systems

- Determination of a safe trajectory for ships that are fully autonomous and remotely controlled to assist navigation decisions.
- Develop autonomous navigation system for crewed ships and remotely controlled and fully autonomous unmanned vessels.

#navigation systems







GMU's R&D activity in Mechanical and Materials Engineering is connected not only with minimising the negative effects of applied technology on the environment but also the assessment of the technical state of machines or devices, testing their dynamic properties and improving operating conditions. Modern technologies for the manufacture of polymer materials and the assessment of their properties are also an important part of this area of R&D.



Services provided:

- *diagnostic and monitoring services for machines and their parts;*
- *assessment of conditions for the operation of machinery and their parts;*
- *manufacturing machinery components, ship hulls and other manufacturing services;*
- *testing for the reduction of particulate matter emissions in exhaust gases and intake gases;*
- *assessment of the rheological properties of operational fluids;*
- *polymer materials manufacturing services;*
- *assessment of the properties of various materials using modern methods.*



The range of services we offer in this area are aimed in particular at companies from the maritime industry, including the ship-building and mechanical industries, but also the energy, petrochemical, automotive transport and packaging industries.

The proposed scope of research of GMU's fourth area of R&D is in line with two Pomorskie Smart Specialisations (PSS):

- **PSS1: Offshore and port and logistics technologies;**
- **PSS3: Ecoefficient technologies in the generation, transmission, distribution and consumption of energy and fuels and in construction.**

*#new generation fuels #environmentally friendly products
#modern materials*

Analysis of machining and burnishing process parameters

- Research on the impact of machining parameters and tool geometry on energy parameters and cutting force.

TOOLS AND APPARATUS:

length and diameter measuring tools | coordinate measuring machine | turning force measurement kit | digital industrial microscope | profilometer

*#solid matter
#machine
components*



Analysis of the parameters of the abrasive machining process

- Research on the parameters of abrasive machining - grinding of disc faces and valve sockets for the identification of requirements for the regeneration of machine elements.

TOOLS AND APPARATUS:

grinding machine for grinding disc faces and valve sockets

*#plug face
#valve socket
face*



Diagnostics and assessment of marine machinery, equipment and structures

- Testing of components of the structure of machines and devices based on analysis of combustion pressure, videoendoscopy and measurement of torsion shaft vibrations.
- Dynamic testing of structural elements.

TOOLS AND APPARATUS:

indicators (electronic portable) multichannel data recorder | data acquisition card | videoendoscope | software: MSC Nastran-Patran, Ansys, Matlab, Simulink, Pulse Reflex | apparatus: piezoelectric converters, inductor, digital analogue converters and laser vibration sensors.

*#ship engines
#shafts
#steel
#non-ferrous
metals*



Diagnostics and assessment of components of the machine propulsion system

- Assessment of the technical status of the propulsion system with damage analysis.

TOOLS AND APPARATUS: laser alignment system for rotor machines | shaft springing machine

#propulsion system



Diagnostics and assessment of machine parts and their connections

- Testing of machine components and identification of their damage.
- Selection of welding parameters of aluminium alloys, mainly groups 5xxx and 7xxx.

TOOLS AND APPARATUS: universal profilometer and hardness meter | acoustic emission kit | arc welding stations using MMA, MIG/MAG, TIG, and FSW methods

**#solid matter
#machine parts
#aluminium alloys**



Operation fluid testing

- Determination of combustion heat and calorific value in accordance with standards DIN 51 900, ISO 1928, ASTM 240D, BSI and PN-81/G-04513.
- Research of physical and chemical properties, assessment of the degree of pollution and consumption of oils.
- Advice on reducing ageing effects and minimising the consumption of fuels and lubricating oils.
- Consulting on the use of alternative fuels and lubricating oils.

TOOLS AND APPARATUS: calorimeter | Spectroil spectrometer | rheometer | modified quadricycle apparatus | automatic ignition temperature test apparatus by closed cup method | titrators | vibration viscometer | automatic laboratory particle counter | particle size | shape and number analyser | an original low-temperature pyrolysis station

**#solid fuels
#liquid fuels
#biofuels
#oils
#lubricants**



Research and structural characteristics of coatings

- Assessment of coatings for the manufacture, regeneration and diagnostic of machine components based on the microstructure, roughness, and arched hardness of technical and regenerative coatings.
- Determination of the effect of technological process parameters on the performance of metal coatings and metal-ceramic coatings.

TOOLS AND APPARATUS:

scanning electron microscope |
metallographic microscope | confocal
microscope | optical microscope,
profilometer | hardness meter | ultrasonic
meter | blow torch

#metal coatings
#metal-ceramic coatings



Structural and strength testing of structural steel materials

- Topographies of the surface of construction materials.
- Static and dynamic testing of structural materials.
- Corrosion tests in normal atmospheric conditions and a salt mist chamber, and fatigue-corrosion testing of structural materials for the preliminary assessment of their properties.

TOOLS AND APPARATUS:

profilometer | atomic force microscope |
dynamic fatigue machine | impact
hammer | salt mist chamber

#steel
#non-ferrous metals



Manufacture of composite materials

- The synthesis of composite materials by manual laminating, vacuum bag or vacuum infusion, according to the chosen technology.

TOOLS AND APPARATUS:

vacuum infusion site

#modern composites



Structural and strength testing of composite materials

- Research on the structure and hardness of composites.
- Research on the topography of the surface of composites.
- Static and dynamic testing of the strength of composites.

TOOLS AND APPARATUS: scanning electron microscope | optical microscope | hardness meter | atomic force microscope | dynamic fatigue machine | impact hammer

#composites



Manufacture of biodegradable polymer materials

- The synthesis of polymer materials based on chosen substrates

TOOLS AND APPARATUS: a reactor connected to a temperature sensor | vacuum pump | mechanical stirrer

#ecopolymers



Characteristics of biodegradable polymer materials

- Testing of the structure, density and hardness of biodegradable polymer materials.
- Topographies of the surface of biodegradable polymer materials
- Determination of water vapour permeability of biodegradable polymer materials.
- Determination of thermal properties of biodegradable polymer materials.
- Static and dynamic testing of the strength of biodegradable polymer materials.
- Determination of the wetting angle and surface energy of polymer materials.

TOOLS AND APPARATUS: scanning electron microscope | optical microscope | hardness meter | analytical scale with a density determination attachment | FTIR spectrometer with ATR attachment | profilometer | atomic force microscope | DSC calorimeter | water vapour transfer device | dynamic fatigue machine | impact hammer | goniometer

#ecopolymers





The R&D services offered within the area of Management, Information technology and Product quality provide a comprehensive response to the expectations of businesses, organisations, or well-informed staff or customers. Needs diagnostics allow for the identification of effective and innovative solutions that strengthen the market competitiveness of companies and their dynamic growth.



Services provided:

- *the development of tourism, hospitality and business activities;*
- *analyses for the development of new methods and tools used in human resources management;*
- *creation of health-promoting food products and raising awareness of good health among the public;*
- *consumer research;*
- *marketing research;*
- *social dependency research;*
- *application of information technologies, and assessment of their efficiency and quality;*
- *data analysis services, including Big Data.*

The fifth area of GMU's R&D offering is aimed in particular at companies in the services industry, including hospitality, tourism, and manufacturing, especially the food industry, the packaging industry, automation, information technology, environment protection and health, as well as non-governmental organisations and others.

The proposed scope of research within the area of management, information technology and product quality is in line with all four Pomorskie Smart Specialisations (PSS):

- **PSS1: Offshore and Port and Logistics Technologies;**
- **PSS2: Interactive technologies in an information-saturated environment;**
- **PSS3: Ecoefficient technologies in the generation, transmission, distribution and consumption of energy and fuels and in construction;**
- **PSS4: Medical technologies in the area of civilisation and ageing-associated diseases.**

Implementation of information technology in management

- The use of information technology, including the creation and supervision of the implementation of methods, algorithms and tools for data analysis, improving the process of streamlining and automation of management, marketing, and decision-making at tactical and operational levels.

**#information
technology**



Use of IT tools for data analysis

- Consulting on the application and implementation of IT tools based on machine learning algorithms and artificial intelligence.
- Analysis of large data sets based on Big Data, Data Mining, data grouping, and detection of relationships and associations in data.

TOOLS AND
APPARATUS:

UML | Python and TensorFlow

#Big Data



Forecasting of changes in financial markets

- Analysis of the use of search engine data to forecast changes in financial markets, leading to an effective analysis of changes, and improvement of model predictions and forecasting.

TOOLS AND
APPARATUS:

Statistical Analysis Software

**#financial
markets**



Management systems

- Advice on quality management systems.
- Advice on food safety.
- Consultancy on energy management systems.

**#ISO/HACCP/
GMP/GLP/HEMS**



Marketing research services

- Preparation of research, data collection, data analysis, data communication and evaluation.

TOOLS AND
APPARATUS:

Stata | Gretl and Statistica

#marketing



Organisational Management Services

- B2C and B2B consultancy for strategic development and assessment of the organisation's competitive position.
- Support in improving soft skills among the organisation's staff.

*#organisation
of companies*



Quality of life research

- Diagnosis of working environments in the hospitality industry to improve work-life balance.
- Assessment of working conditions.
- Research on the impact of selected factors on sustainable development in terms of quality of life.
- Research on the relationship between social mobility and health.

TOOLS AND
APPARATUS:

Stata | Gretl and Statistica

#quality of life



Research on consumer attitudes and behaviour

- Evaluation of consumer attitudes and behaviour in the consumer goods market using qualitative and quantitative methods.
- Evaluation of consumer attitudes and behaviour towards food using qualitative and quantitative methods.

TOOLS AND
APPARATUS:

Stata | Gretl and Statistica

*#identified
recipient*



Determination of the properties of food products

- Physiochemical research.
- Sensory assessment.
- Textural analysis.
- Colour intensity tests.
- Determination of levels of vitamin C, anthocyanins, chlorophylls, carotenoids, the ability to eliminate DPPH free radicals, and the total content of polyphenols, heavy metals, nitrates and sweeteners.
- Identification of the role of surface phenomena in shaping the functional characteristics of food.

TOOLS AND APPARATUS:

sensory assessment | texture analyser
colourimeter | measuring station with computer
measurement of sorption kinetics | a set of
excavators | climate chamber | analytical
weighing scales | AquaLab | centrifuge | ovoscope
| laboratory dryer | UV spectrophotometer

#food products



Storage of food products

- Evaluation of storage quality and durability by determining the sorption properties, porosity, bulkiness, loose and shaken density, staling, drying, non-enzymatic browning, acidity, water absorption, defrost leak, and stock quality.

TOOLS AND APPARATUS:

measuring station equipped with computer
measuring of sorption kinetics | set of excavators,
climate chamber | analytical weighing scales |
AquaLab | centrifuge | ovoscope | laboratory dryer

#food products
#food storage



Microbiological evaluation of food products

- Testing of the microbiological hazards of food from the production and marketing stages until the end of shelf life.
- Testing of the microbiological purity of food to ensure the appropriate quality.
- Monitoring of the microbiological purity of the production space, production line and air equipment.

TOOLS AND APPARATUS:

nephelometer

#food products
#food safety



Assessment of the interaction between packaging and product

- Determination of the effect of packaging materials on the content of food products.

TOOLS AND APPARATUS:

FTIR Spectrometer with ATR attachment | DSC
calorimeter | moisture analyser water vapour
permeability testing kit | goniometer | durometer

#packaging
and product



OUR FLEET



THE LWÓW

Built in 1869 in Great Britain as a cargo-passenger frigate named the "Chinsura", and purchased in the summer of 1920 for USD 247,000 for the newly formed Maritime School in Tczew, the "Lwów" was rebuilt into a training ship with parts of the cargo bay purposefully left intact. During its service under the Polish flag, the ship sailed 65,000 NM on training voyages.



THE DAR POMORZA

A three-masted frigate, purchased in July 1929 by the Pomeranian National Fleet Committee to replace the "Lwów." The "white frigate" carried out 102 training voyages during the years 1930-1981, sailing 500,000 NM and taking on board 13,384 student trainees. Today, the ship is kept at the Pomeranian Quay in Gdynia as a museum and monument to Polish maritime heritage.



THE DAR MŁODZIEŻY

The "Dar Młodzieży", a three-masted B-95 frigate and GMU's training sail ship, continues the tradition of its two famous predecessors, the "Lwów - the Maritime School's sailing ship during its early days based in Tczew, and the "Dar Pomorza", known as the "white frigate". The "Dar Młodzieży" is the first sailing ship built in a Polish shipyard, according to an original Polish project, and was from its conception designed as a training sail ship.

One of the first regattas that the "Dar Młodzieży" took place in was the Tall Ships Race. During the race it won two trophies, the first for the quickest race time, and the second a Fair Play award granted by the International Olympic Committee for its involvement in a rescue operation following a fire onboard the yacht "Peter von Danzig".

During the years 2018-2019, the "Dar Młodzieży" took part in a round-the-world trip known as the Independence Voyage. During the voyage the ship called at the ports of Tallinn, Copenhagen, Stavanger, Szczecin, Bremerhaven, Bordeaux, Tenerife, Dakar, Cape Town, Port Louis (Mauritius), Jakarta, Singapore, Hong Kong, Osaka, San Francisco, Los Angeles, Acapulco, Panama, Cartagena, Port Everglades - Miami, Nassau (Bahamas), Ponta Delgada, and London, covering over 38,000 NM in 313 days.





HORYZONT

The Horyzont research and training ship was built in the year 2000 on the hull of the "Polarex" polar expedition ship. Equipped with multiple modern navigation systems, the vessel enables trainees to improve the knowledge and practical skills required of navigation, mechanical, and electrical officers of the merchant fleet. The Horyzont is also equipped to conduct specialist marine research and regularly undertakes expeditions to the polar regions.



IMOR

The R/V IMOR research ship was launched in February 2006. This "floating marine laboratory for the needs of the energy and maritime industry" was the first Polish vessel to be used in coastal and shallow floodwater research. Currently, the vessel's primary task is to conduct pre-investment research in the Baltic Sea, monitor the Polish coastal zone, and provide support in the estimation of the resources required for artificial beach nourishment projects. The ship's design allows for carrying out a variety of tasks:

- measurement of the seabed – for the construction of wind farms, laying of submarine cables and pipes;
- inventory of mineral deposits, estimating the volume of dredging work;
- oceanographic research on the deep-water and surface of the sea, and research on the near-water layer of the atmosphere;
- ecological effects of the various forms of human activity on the environment and the biocoenosis of marine waters.

The ship is operated by two five-man crews working in shifts, allowing it to operate 24 hours a day.



OUR CLIENTS

During the last five years, we have completed more than 900 R&D projects, and our experience continues to grow.

- Electro-magnetic Field Measurements
- Testing of sediment cores and soil sediment samples
- Testing of water and sewage samples
- Monitoring of the quality of water and leachates at landfill
- Analysis of swell within internal port waterways
- Projections of the environmental impact of investments
- Swell testing in a port entrance area
- Marine and terrestrial environmental research
- Measurements of breakwaters and piers
- Opinions on innovation in food products
- Measurement and assessment of voltage quality
- Opinions on innovation in maritime and automotive industry technology
- Description of the analytical path for algorithms for implementation in an IT system
- Expert appraisals on marine transport
- Expert appraisals on safety at sea
- Expert appraisals on the reliability of equipment onboard seafaring vessels
- Development of an innovative vehicle charging station
- Rotary machine productivity analysis
- Analysis of changes in the mooring position of a vessel moored next to a buoy or quay
- Navigational analysis of the approach and mooring of vessels
- Design of fluid-flow machine seals

In realising the objectives of Poland's maritime Policy and the priorities of the University's development strategy, GMU has for many years fostered relations with businesses, organisations and institutions from within the socio-economic environment at home and abroad.

Our broad offering of cooperation services caters to the needs of the socio-economic environment, whilst embracing the challenges of modern science and the national and global economies.

WE LOOK FORWARD TO WORKING WITH YOU

We would like to thank all of our partners for their trust and cooperation.

Rolls-Royce Poland Sp. z o.o.
 Mayern Sp. z o.o. **Remontowa Electrical Solutions Sp. z o. o.**
 Agencja Rozwoju Mazowsza S.A. PasCom Sp. z o.o. Kuehne+Nagel Sp. z o.o.
 Investin Sp z o.o.
 TTcomm SA **RWE Offshore Wind Poland Sp. z o.o.** Gmina Miasta Gdyni
 Prace i kontakty i usług inżynierski „Gdynia 2100” Sp. z o.o.
MEWO S.A. Zarząd Morskiego Portu Gdańsk SA Solar-Energy S.A.
 Artur Godyn Przedsiębiorstwo Droppen F.G. Tormec Reduktor Sp. J. **CRIST S.A.** Lubawa S.A.
 REDD AI Sp. z o.o. **Polska Grupa Energetyczna PGE S.A.** BinarApps Sp. z o.o.
 Byotta Sp. z o.o. **Polskie Elektrownie Jądrowe Sp. z o.o.** Enamor Sp. z o.o.
 Urząd Marszałkowski Województwa Pomorskiego New MBK Sp. z o.o. Bałtyckie Centrum Transferu Technologii S.A.
Graal S.A. **ABB Sp. z o.o.** **PGE Baltica Sp. z.o.o.** **SESCOM S.A.** **Euro-Tech Sp. z o.o.**
 Pomorska Agencja Rozwoju Regionalnego S.A. Gdańska Stocznia Remontowa im. J. Piłsudskiego S.A.
 Zarząd Portu Morskiego Gdynia S.A. **Polski Koncern Naftowy PKN ORLEN S.A.**
 NavSim Polska Sp. z o.o. KONGSBERG Maritime Poland Sp. z o.o. PC Diversa - Wujoloch Stachowiak Primulator Sp. z o.o.
PROJMORS Biuro Projektów Budownictwa Morskiego Sp. z o.o.
 MAR-EL. Serwis Mariusz Samborski LONZA NATA Teresa Zarębska-Waldemar Michalowski Sp. J.
Agencja Rozwoju Pomorza S.A. **Urząd Morski w Szczecinie**
 ORPLAST Jerzy Orlikowski Sp. J. SEnControl Ltd. Sp. z o.o.
Urząd Morski w Gdyni **Główny Inspektorat Ochrony Środowiska**
 Zegluga Mazurska Sp. z o.o. PKP Szybka Kolej Miejska w Trójmieście Sp. z o.o. Geotronics Polska Sp. z o.o. Cargosurvey Lukasz Przygoda
Delta Power Sp. z o.o. **MPL Techma Sp. z o.o.**
 KANDIS Software Poland Sp. z o.o. Zarząd Portu Morskiego Gdynia S.A.
Solwit S.A. **Technical Ship Management Sp. z o.o.** **Baltic Power Sp. z o.o.** **Hrtec Sp. z o.o.** **Energa Operator S.A.**
Andrem Sp z o.o. **Remontowa Shipbuilding S.A.** Geofizyka Toruń S.A.
 OX2 Sp. z o.o. Ocean Network Express (Europe) Ltd. Sp. z o.o. Szczecińska Stocznia Remontowa FRYFIA S.A.
Domat Consulting Sp. z o.o. **Alfa Laval Kraków Sp. z o.o.**
 DDS Poland Sp. z o.o. NAVIMOR International Sp. z o.o.
Główny Urząd Miar
 MAG Offshore Sp. z o.o. **MAEM Sp. z o.o.**



TECHNOLOGY TRANSFER OFFICE

The Technology Transfer Office is an independent unit within the Division of the Deputy Rector for Cooperation and Development at GMU. The unit was established to support the University in making the most of its intellectual and technical potential and in the transfer of research outcomes to the economy, especially in relation to innovations relevant to the maritime industry.

OUR MISSION



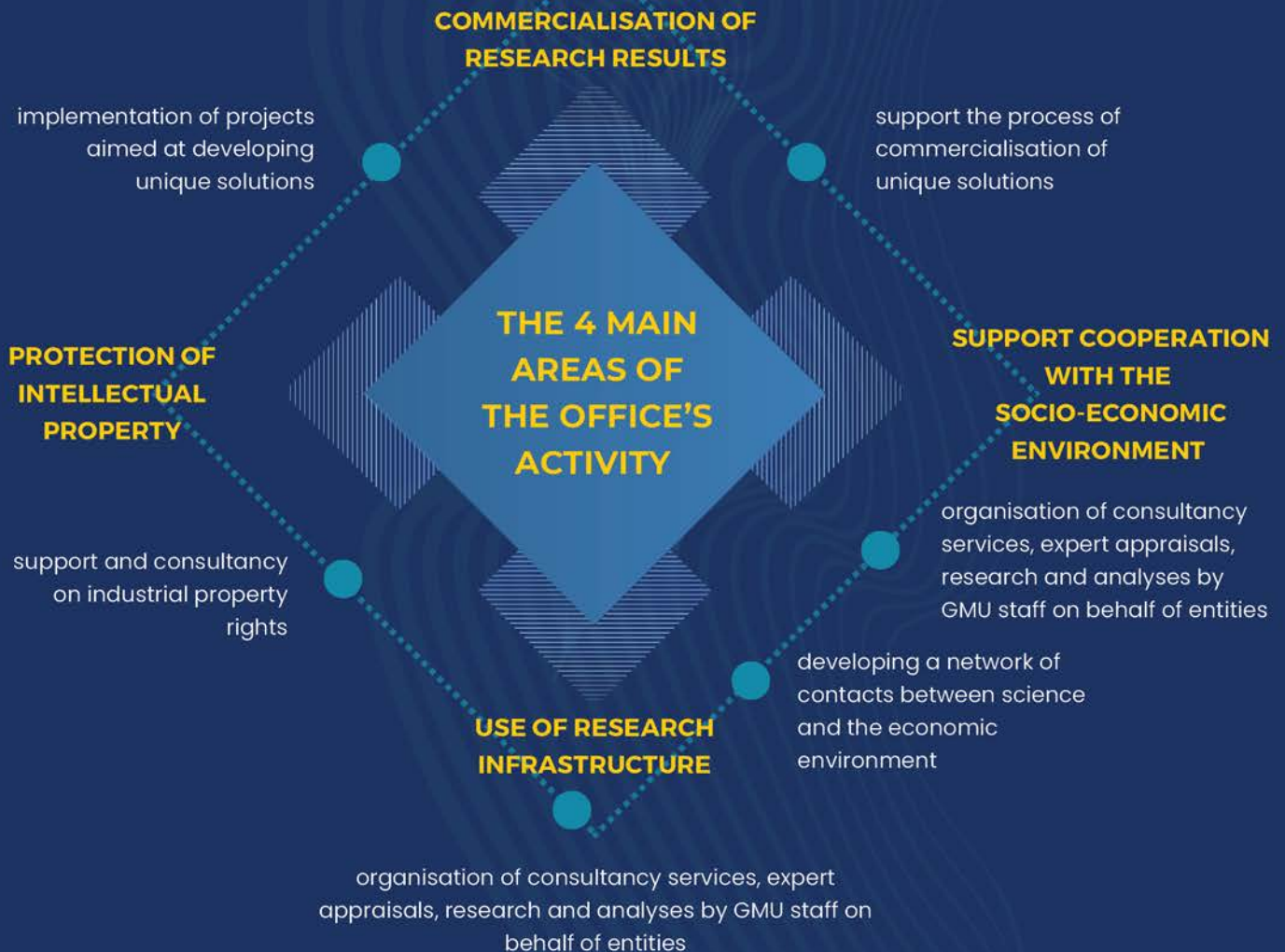
Develop business relationships, strengthen academic inventiveness, and transfer knowledge and technology focused on innovation and current socio-economic challenges.

OUR VISION



Increase the contribution of innovative solutions and services from universities to the economy of the region, the country and the world, and develop a local ecosystem of knowledge and innovation.

The Office engages in commercial, consultancy, information, training, and promotional activities.





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At Gdynia Maritime University we are continually improving the competencies that enable us to provide professional services that meet the expectations and needs of our partners, entrepreneurs or other entities within the socio-economic environment. The work currently carried out at GMU is interdisciplinary, involving a range of tasks, including planning, pre-investment, investment, inventory, and monitoring.

We hope that the potential and experience we have to offer will contribute to the establishment or extension of cooperation between your organisation and Gdynia Maritime University.

We look forward to hearing from you!



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