

# Research offer 2024

# INSTITUTE OF WOOD SCIENCES AND FURNITURE



# STRUCTURE

The Institute of Wood Sciences and Furniture was established on October 1, 2019 on the basis of the former Faculty of Wood Technology at the Warsaw University of Life Sciences, a Faculty with over 70 years of tradition.

**Director**  
D.Sc. Paweł KOZAKIEWICZ, Associate  
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The mission of the Institute of Wood Sciences and Furniture is to serve the economic and intellectual development of Polish society and the European community, with particular emphasis on the development of all branches of the wood industry and accompanying economic sectors.

DISCIPLINE OF FOREST SCIENCES

**Dean**  
D.Sc. Piotr Borysiuk,  
Associate Professor

**Institute  
secretarial  
office**



**Department of Mechanical and  
Processing of Wood**

**Department of Wood Sciences  
and Wood Preservation**

**Department of Technology and  
Entrepreneurship in the Wood  
Industry**

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## CUTTING TOOLS

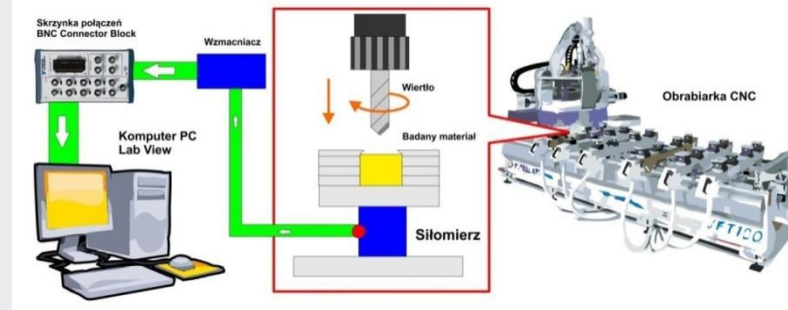
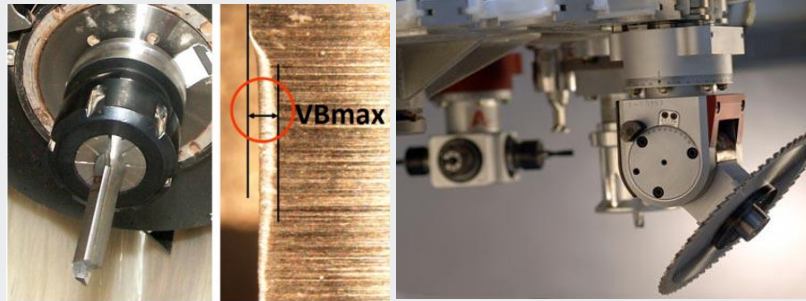
- ✓ Selection of cutting tools for technological machining
- ✓ Modification of cutting tools to increase their tool life
- ✓ Innovative cutting tool materials

## CUTTING MACHINE TOOLS

- ✓ Selection of machines in the technological process of furniture production
- ✓ Programming and operation of CNC machines for the furniture industry
- ✓ Testing and configuration of machinery

## TOOLS AND MACHINING CONDITION MONITORING

- ✓ Increasing efficiency and reducing energy consumption of the production process
- ✓ Optimization of cutting parameters
- ✓ Analysis and improvement of machining quality



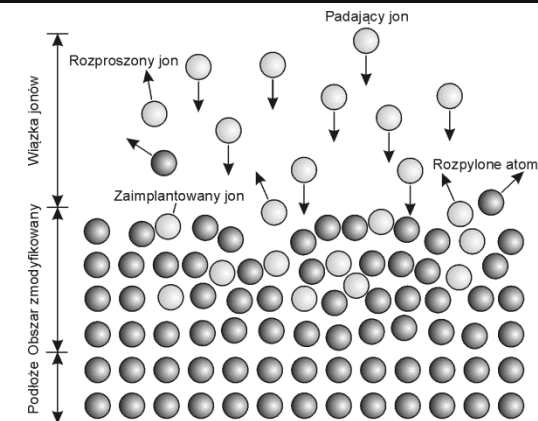
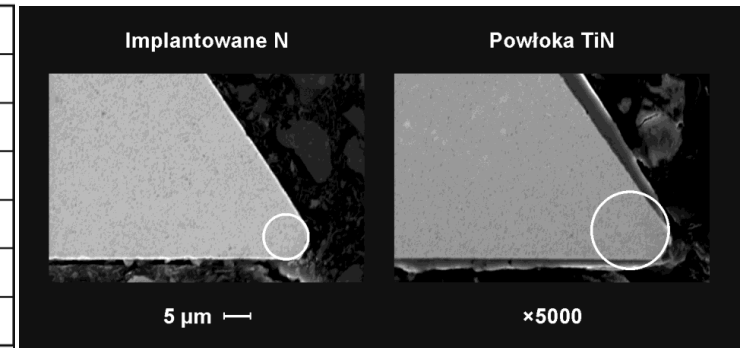
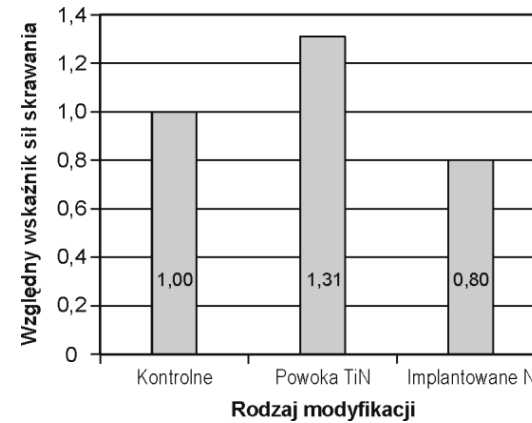
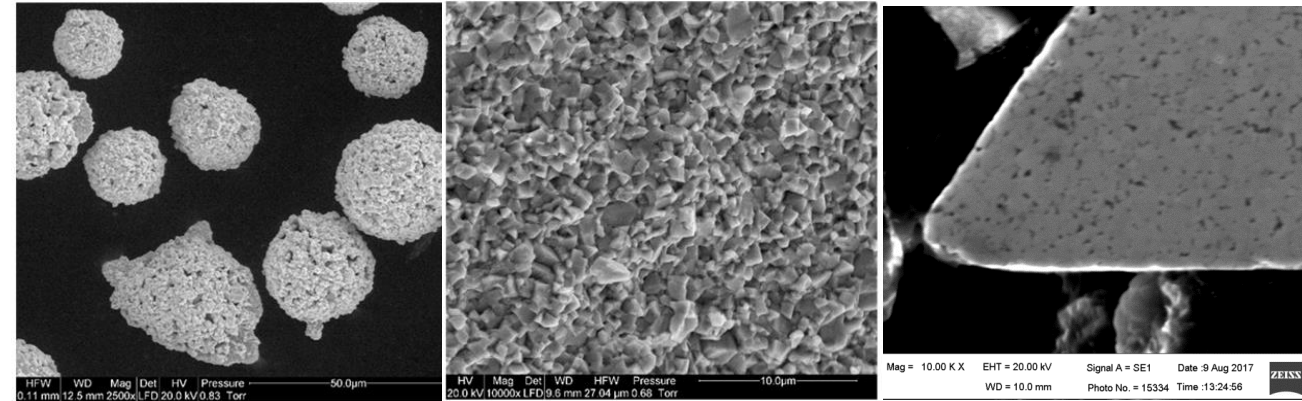
# RESEARCH OFFER

# DEPARTMENT OF MECHANICAL PROCESSING OF WOOD



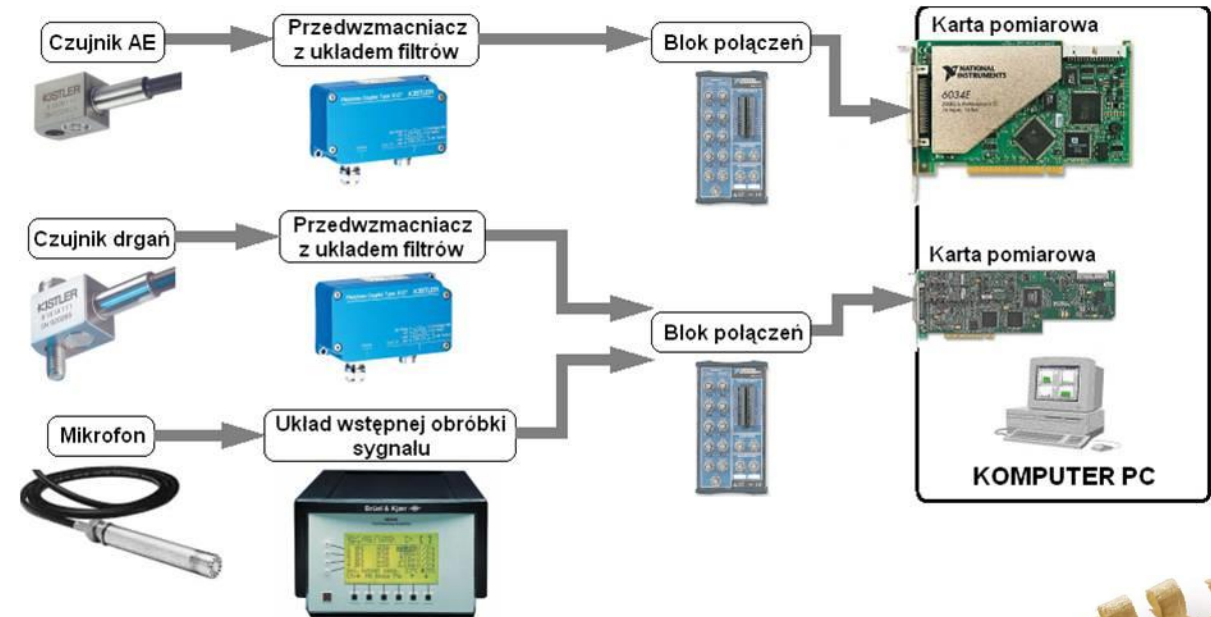
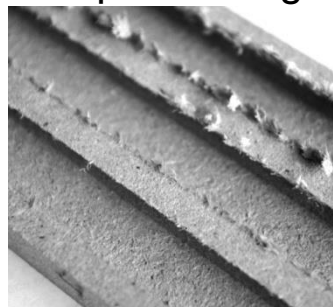
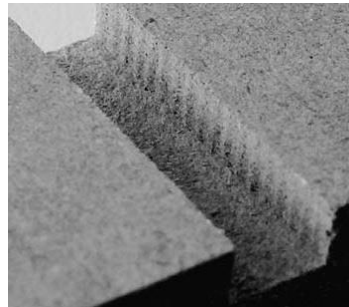
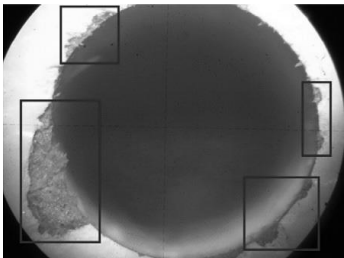
## Cutting tools and machines testing

- › Development and implementation of the optimal microstructure and sintering technology of WC-Co tungsten carbide for tool blades for machining difficult-to-cut wood materials.
- › Implementation of technology for modifying the surface layer of cutting tools in the ion implantation process to increase their tool life and reduce the variability of the wear rate.
- › Implementation of optimization techniques for programming CNC machine tools for the furniture industry, including testing the production parameters of the machines.



## Machining process diagnostics

- Machine and software optimization of cutting parameters to increase efficiency and reduce energy consumption of the production process.
- Implementation of the first generation tool condition diagnostics system for milling and drilling wood materials on CNC machining centers for the furniture industry. The system will assess natural and accelerated wear of the tool, detect catastrophic blunting and the moment of collision.
- Implementation of an inspection vision system for assessing the quality of wood-based materials processing.







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## TEAM OF CHEMISTRY

A wide spectrum of research and chemical analyzes of wood and other lignocellulosic materials, as well as conducting thermal, thermomechanical and chemical modification processes of wood, along with implementation proposals for products manufactured using these techniques..

## TEAM OF WOOD PRESERVATION

Testing the resistance of wood, wood-based materials and other lignocellulosic materials to biotic and abiotic factors; identification of fungi and xylophagous insects.

## TEAM OF WOOD ANATOMY AND PROPERTIES

Identification of wood and analysis of its structure, as well as determining the full characteristics of the physical and mechanical properties of this raw material and materials made from it.



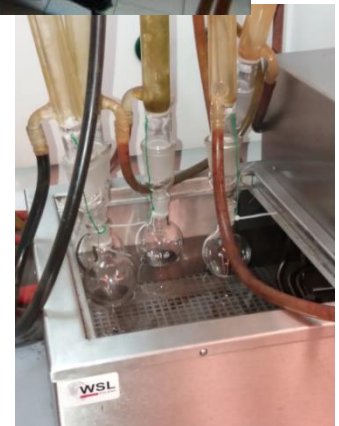
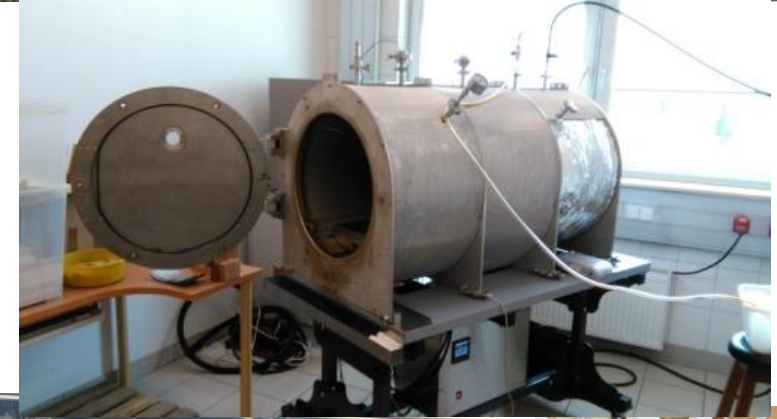
# OFFER

## DEPARTMENT OF WOOD SCIENCES AND WOOD PRESERVATION

## TEAM OF CHEMISTRY

### **Selected scientific researches related to wood and other lignocellulosic and renewable raw materials for practical use.**

- Analysis of wood and other lignocellulosic materials using classical and instrumental methods (e.g. analysis of the chemical composition of biomass, degree of polymerization and color);
- Assessment of the degree of threat to pine stands caused by mistletoe by analyzing the chemical composition and selected chemical properties of pine wood;
- Research on pretreatment methods (e.g. steam explosion, high-temperature hydrolysis, soaking in an aqueous ammonia solution) of lignocellulosic raw materials and the enzymatic hydrolysis process in the bioethanol production technology;
- Research on wood modification methods (e.g. thermal in a nitrogen atmosphere, chemical - use of polymers and thermomechanical densification) and its selected properties;
- The use of lignocellulosic and renewable materials to create new products in the field of green chemistry (e.g. synthesis of furfural and furfuryl alcohol, production of xylose, production of furan fuels and use of bacterial cellulose to obtain bioethanol).

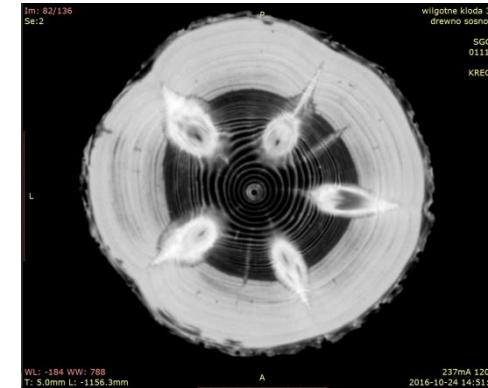




## TEAM OF WOOD ANATOMY AND PROPERTIES

**Identification of wood and analysis of its structure, as well as determining the full characteristics of the physical and mechanical properties of this raw material and materials made from it.**

- Development and testing of non-destructive wood testing techniques: electrometric methods, computed tomography, radiation method, ultrasonic method;
- Cross-sectional research on the structure and physical and mechanical properties of wood, including new species on the market, and "controlling" the properties of wood through its intentional modification;
- Assessment of wood raw material and its suitability for indicated applications;
- Analysis of wood drying and hydrothermal treatment processes (steaming, brewing, thermal heating);
- Sorting of general-purpose timber and strength sorting (visual and machine) of construction timber;
- Research on the influence of genetic origin and habitat conditions of tree growth on the properties of the wood produced.



Ksyloteka zawierająca ponad 2 tysiące gatunków drewna z całego świata

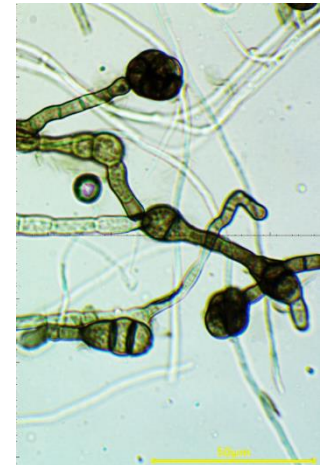




## TEAM OF WOOD PRESERVATION

**Testing the durability of wood and its resistance to biotic and abiotic factors, including the identification of fungi and xylophagous insects.**

- Testing the effectiveness of agents protecting wood and wood-based materials as well as wood products against degradation factors (including field tests).
- Registration and assessment of damage occurring in wood; Destructive and non-destructive methods for determining the state of preservation of wood subjected to biocorrosion (determination of physico-chemical properties).
- Determination of microorganisms and fungal organisms and selection of methods for protecting wood against mold, stains (blue stain) and rots.
- Detection and recognition of wood-feeding insects (including electroacoustic methods) and selection of methods to combat them.
- Mycological and entomological examinations of buildings and wooden structures.





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## TEAM OF ENGINEERING OF WOOD-BASED MATERIALS

Testing the properties of raw materials and wood materials. Analysis and selection of technological assumptions for the production of innovative composite materials.

## TEAM OF WOODEN PRODUCTS CONSTRUCTION AND TECHNOLOGY

Research and design of furniture, interior design items and joinery. Control and analysis of stiffness, strength and quality of materials, elements, components, products.

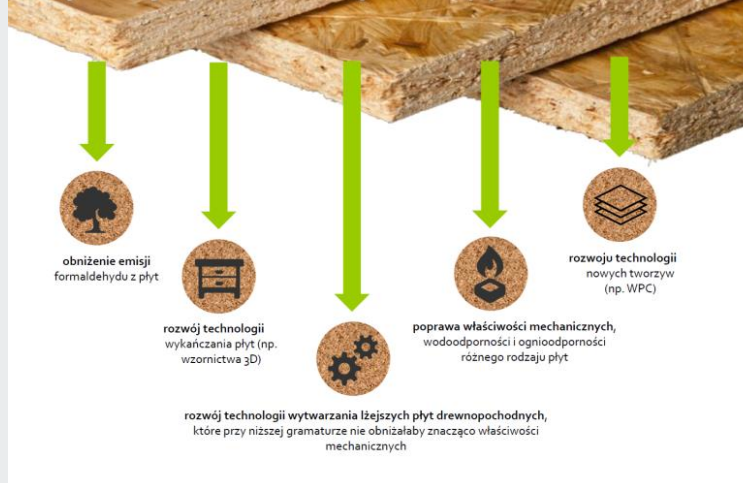
## TEAM OF ENTREPRENEURSHIP IN THE WOOD INDUSTRY

Economics and management in wood and furniture companies, including development strategies, market and competitiveness analyses.

### Czynniki wpływające na rozwój branży



### Najważniejsze kierunki rozwoju branży płyt drewnopochodnych



# OFFER

## DEPARTMENT OF TECHNOLOGY AND ENTREPRENEURSHIP IN THE WOOD INDUSTRY



# TEAM OF ENGINEERING OF WOOD-BASED MATERIALS

## Workshops and laboratories

- testing the physical properties of wood-based materials (thermal properties, surface absorption, swelling, water absorption, etc.)
- testing the functional properties of wood-based materials (accelerated aging processes)
- testing the content and emission of free formaldehyde using the Perforator method and the EN 717-2 method
- testing the mechanical properties of wood-based materials
- testing the strength of joints in wood and wood-based materials
- testing the quality of adhesive bonding and the strength of adhesive joints
- testing the properties of coating products and paint and varnish layers
- testing the resistance of materials and coatings to UV radiation with the possible simulation of atmospheric precipitation

## LABORATORY OF PROPERTIES OF RAW MATERIALS AND WOOD MATERIALS, TECHNOLOGY WORKSHOP, LABORATORY FOR ADHESIVE BONDING AND FINISHING SURFACE OF WOOD AND WOOD-BASED COMPOSITES

## Consulting, expertise

- new technologies used in the production of wood-based materials and wood products
- assessment of innovation level of technologies and equipment used in wood industry
- new technologies used in the production of wood-based materials and wood products
- new raw materials (including recycled raw materials) in the technology of wood-based materials
- environmental protection in wood technology sector



# TEAM OF WOODEN PRODUCTS CONSTRUCTION AND TECHNOLOGY

## Workshops and laboratories

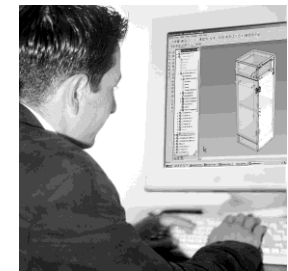
- stiffness and strength of connections in furniture and building structures and joinery elements
- qualitative and fatigue of frame, box and upholstered furniture
- coating properties: adhesion, hardness, color, abrasion, scratching
- aging of finishing coatings, adhesive joints and other materials
- physico-chemical properties and durability of upholstered materials
- surface resistance to UV radiation
- antique furniture in terms of characteristics, conservation and restoration topics
- girders and beams with a length of up to 5 m and a load capacity of up to 10 tons
- adhesion and depth of penetration into the wood of putties, dyes and other finishing materials



## CLIMATE LABORATORY, STRENGTH LABORATORY, MICROSCOPIC LABORATORY LABORATORY FOR TESTING FURNITURE AND THE CONDITIONS OF THEIR USE

## Consulting, expertise

- assessment of innovativeness of technologies and production in furniture and construction plants
- production in accordance with the principles of sustainable development, circular economy, green planet
- quality management in the wood industry
- training and providing opinions on the construction, technology and decoration of contemporary, stylized and antique furniture
- specialized and unusual furniture design, as well as for disabled and elderly people
- traditional and modern wooden buildings





# TEAM OF ENTREPRENEURSHIP IN THE WOOD INDUSTRY

## Research activities

- Implementation of innovative management methods in family businesses
- Evaluation of the economic and financial condition of enterprises
- Internationalisation processes and competitiveness of furniture enterprises
- Trends on the wood and furniture products market in Poland against the background of European trends
- Research into the use of passive phytoremediation methods in forests, parks and urbanised areas
- Use of alternative tree species for remediation of contaminated sites in a closed cycle
- Research for the development of education and training methods in the European Union

## Consultancy, expertise

- Alternative use of post-production raw materials
- Improvement of production processes in wood and furniture enterprises
- Evaluation of the economic and financial condition of enterprises Innovation in Polish woodworking and furniture enterprises
- Implementation of quality management systems in woodworking enterprises
- Management in companies in the wood and furniture industry
- Product data management in the product life cycle



# Other areas of cooperation



**Courses and training**

**Conferences and seminars**

**Research projects and academic exchanges**

**Promotional activities and meetings**

**Internships and apprenticeships**

**Didactic**

Training suggestions:  
 -programming and operation of CNC machines used in the furniture industry  
 - carpentry  
 - classification of general-purpose hardwood and coniferous sawn timber  
 - control of the sawn timber drying process- topics agreed with the ordering party

Scientific conference from the series - Wood - the material of the 21st century "Generation 4.0 in the wood and furniture industry,,  
 - June 2024 SGGW Campus in Warsaw

SGGW Days, Job Fairs, Specialized publications, Training materials, Industry fairs, Shows, Competitions, Media events, SGGWTV

Student internships 2 x 3 weeks each (after 2nd and 3rd year of studies)  
 3-month student internships in companies as part of POWER projects (financed by EU funds)



# Institute of Wood Sciences and Furniture



Director  
D.Sc. Paweł  
KOZAKIEWICZ,  
Associate Professor



Deputy director  
Prof. D.Sc.  
Janusz ZAWADZKI



Main building  
of INDM

Technology hall



## We invite you to cooperate - together we can do more!



A description of the full research and implementation offer as well as cooperation opportunities can be found at:

<http://www.indm.sggw.edu.pl/>