

Head of the Department: Assoc. Prof. Witold Gulbiński, Ph.D., D.Sc.

About the Department

The Department of Technical Physics and Nanotechnology brings together specialists in physics, chemistry and materials science who form an interdisciplinary team involved in research on complex scientific and technical issues. The Department's research is conducted in close cooperation with industry.

At present, the Department's main directions of research comprise vacuum-plasma technology of surface treatment and coatings deposition, technology of technical ceramics and technology of catalytic materials, including:

- designing, manufacturing via vacuum-plasma methods and the study of structure and properties of new nanocomposite materials, based on metal nitrides and carbides as well as on amorphous carbon, intended for thin-film coatings reducing friction and wear of cutting tools, machine parts and mechanisms,
- the study of corrosion properties of materials and thin layers,
- the study of low-temperature plasma using emission spectroscopy and absorption spectroscopy methods and application of these methods for the control of plasma processes,
- research on new plasma processes where combinations of different plasma excitation techniques are applied,
- design of magnetron and arc plasma sources intended for deposition of thin coatings,
- design and manufacturing of new ceramic materials, including binders for modern grinding wheels,
- research on vacuum-plasma processes of thermo-chemical treatment of constructional materials,
- design of devices and technologies for hybrid treatment of metals by combining surface treatment processes with coatings deposition using PVD method,

- the study of thin oxide layers for catalytic applications.

The Department has modern and well-equipped laboratories, including laboratories of electron microscopy and structural research, tribology, thermal analysis, corrosion testing.

Technological laboratories possess scientific and research equipment for wear-resistant coatings deposition with PVD method, plasma nitriding, hybrid thermo-chemical treatment, and manufacturing of technical ceramics and catalysts.

The academic staff of the Department conduct teaching activity which is closely related to their scientific and research activity. The Department coordinates teaching of the study programme for Materials Science and Engineering (Engineer's and Master's degrees, 2 specializations) as well as provides courses in the area of materials science for the following degree programmes: Mechatronics, Biomedical Engineering, and Mechanical Engineering.