



POLISH NATIONAL AGENCY
FOR ACADEMIC EXCHANGE



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PROGRAMME

<p>name of the unit:</p> <p>DEPARTMENT OF STRENGTH OF MATERIALS</p> <p>Lodz University of Technology</p>		<p>symbol:</p> <p>K-12</p> <p>http://www.kwm.p.lodz.pl</p>
<p>head of the unit:</p> <p>Prof. Tomasz Kubiak, PhD, DSc</p>	<p>potential promoters:</p> <p>Prof. Maria Kotelko, PhD, DSc Prof. Zbigniew Kołakowski PhD, DSc Prof. Radosław Mania, PhD, DSc Prof. Tomasz Kubiak, PhD, DSc</p>	<p>contact person:</p> <p>Leszek Czechowski, PhD. phone: 48-42-631-22-15 leszek.czechowski@p.lodz.pl</p>
<p>scope of activities:</p> <p>The main areas of research activity in the field of mechanics of thin-walled structures are:</p> <ul style="list-style-type: none"> development of mathematical models, numerical simulations and experimental verification of thin-walled structural elements made of isotropic and composite materials (FRP, FML or FGM laminates), analysis of the failure mechanisms and energy absorption in thin-walled elements subjected to impact, experimental and numerical tests in the field of fracture mechanics for laminates, numerical simulations and experimental studies of biomechanical elements with the main focus on the stress state and deformations in bone systems and implants (e.g. mandible, teeth, implants and bone connecting elements). 		     
<p>present activities:</p> <p>We develop mathematical models, conduct numerical simulations and experimental tests of thin-walled structural elements made of steel materials or laminates, including hybrid ones. We investigate thin-walled structural elements loaded statically or dynamically, mechanically and thermo-mechanically, considering their stability (including interaction of various buckling modes), post-buckling equilibrium paths, load-carrying capacity and phases of failure (including delamination and its propagation in the case laminates).</p> <p>We analyse the fixation of mandibular bone fractures in terms of strength by conducting numerical simulations using the results of experimental studies on the structure of the mandibular bones of other research teams.</p> <p>This activity is complemented by scientific and technical works in the field of stress and deformation analysis of structural elements of machines and devices carried out in cooperation and for the needs of industry. The team conducts research for large corporations such as: Airbus, B/S/H, ABB and provides support for local companies, e.g.: OKB, SPRAK or POLTAU.</p>		
<p>future activities:</p> <p>We plan further analysis and development of methods for the study of nonlinear static stability and dynamic buckling of thin-walled elements. Further work in the field of fracture mechanics of modern sandwich materials. Improving numerical models based on their experimental verifications. Development of biomechanical models and numerical FEM analyzes. The team intends to take up new topics related to the endurance, including fatigue, and stability of elements produced by 3D printing.</p>		



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[publications/patents, awards, projects:](#)

Exemplary publications:

- Gliszczyński A., Kubiak T., Wawer K. Barely visible impact damages of GFRP laminate profiles – an experimental study. Composites Part B, 2019, 158:10-17, doi: 10.1016/j.composites.2018.09.044
- Kołakowski Z., Mania R., Semi-analytical method versus the FEM for analysis of the lokal post-buckling of thin-walled composite structures. Composite Structures, 2013, 97:99-106, doi: 10.1016/j.compstruct.2012.10.035
- Kozakiewicz M., Swiniarski J., "A" shape plate for open rigid internal fixation of mandible condyle neck fracture. J. Cranio Maxillofac. Surg., 2014, 42:730–737. doi: 10.1016/j.jcms.2013.11.003

[keywords:](#)

strength of materials, mechanics of thin-walled structures, load-carrying capacity, energy absorbers, failure mechanics, fracture mechanics, biomechanics

[list of internship proposal in this research team:](#)

- analysis of the destruction of energy absorbers with a drop hammer,
- adaptation (design and construction) of research and didactic test stands,
- determination of critical temperatures for thin-walled structures made of FRP laminates.