

comparison to the former method, which is due to the non-linear nature of the moment-curvature relation of the fabrics. The results also revealed that not only the punch density and needle penetration depth but also the mass per unit area of the fabrics significantly affects the rigidity of the needled fabrics.



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# Technical University of Łódź Faculty of Material Technologies and Textile Design Department of Technical Mechanics and Computer Engineering

### Head of department:

Prof. Krzysztof Dems, Ph.D., D.Sc., Eng.

### Current research topics:

- Modelling and identification of the mechanical properties of textile composite materials
- Optimisation of the mechanical and thermal properties of fibre reinforced composites
- Sensitivity analysis and optimal design of the shape and thermomechanical properties of structural elements
- Identification and computer oriented simulation of defects in structures using thermographic methods and modal analysis

### Area of research activities:

- Mechanics of textiles, textile structures and composites
- Theory and application of textile and structural mechanics
- Sensitivity analysis and optimal design of structures subjected to thermal and mechanical loads
- Numerical methods in textile and structural mechanics
- Computer-oriented analysis, synthesis and optimisation of materials and structures
- Operation of textile machinery and its reliability
- Application of computer science in textile and mechanical engineering

### Research achievements:

- Creation of a scientific school with varied approaches to optimal design, identification and sensitivity analysis of structural elements, textile products, composite structures subjected to thermal and mechanical loads
- Creation of principles for the modelling of textile products subjected to static and dynamic loads
- Computer oriented analysis and synthesis of textile products, composite structures and structural elements subjected to mechanical and thermal loads

### For more information please contact:

Department of Technical Mechanics and Computer Engineering  
Technical University of Lodz  
ul. Zeromskiego 116, 90-924 Lodz, Poland  
tel.: (48)(42) 631-33-59 e-mail: dems@kmt.p.lodz.pl web site: <http://www.k41.p.lodz.pl/>

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