

# Table of Contents

## Preface, Committee and Sponsors

## Chapter 1: Residual Stresses - Measurement Methods and Analysis

<b>Utilisation Possibilities of PhotoStress Method in Determination of Residual Stresses</b> P. Frankovský, F. Trebuňa, O. Ostertag, P. Šarga, I. Delyová and J. Kostka	3
<b>2D Residual Stress and Hardness Maps in Steel Laser Weld with Filler Wire</b> K. Kolařík, K. Trojan, J. Čapek, J. Sís, O. Řídký, L. Zuzánek and N. Ganev	9
<b>Neutron Diffraction Studies of Residual Stress Distribution in the Vicinity of the Single Pass Fillet Steel Welds</b> L. Mráz, L. Karlsson, M. Vrána and P. Mikula	13
<b>Analysis of Differential Method Used for the Evaluation of Uniform Residual Stresses by the Ring-Core Method</b> P. Šarga, F. Menda, F. Trebuňa and L. Kováč	20
<b>Uncertainties of the Evaluation of the Hole Drilling Residual Stress Measurement According to the ASTM E837 Standard</b> M. Švantner and J. Skála	24
<b>Residual Stress Analysis in Containers for Transport of Radioactive Materials</b> F. Trebuňa, F. Šimčák, M. Pástor and P. Šarga	28
<b>Theory of Hole-Drilling Strain-Gage Method for the Using of Semiconductor Strain Gauges</b> K. Vítěk	32

## Chapter 2: Development of Experimental Methods of Analysis in Mechanics of Materials

<b>Experimental Investigation of Mechanical Properties of Textile Glass Reinforcement</b> T. Bittner, P. Bouška, M. Kostelecká and M. Vokáč	45
<b>Numerical and Experimental Analysis of Multilayer Mine Protection</b> J. Buchar, R. Řídký, M. Drdlová and J. Trnka	49
<b>Experimental Analysis of Hydrothermal Curing Influence on Properties of Fiber-Cement Composite</b> O. Holčapek, P. Reiterman and P. Konvalinka	55
<b>Experimental Determination of Mechanical Properties for the Purposes of Numerical Simulations of Car Bumper Tests</b> P. Horník	59
<b>Effectiveness of the Modified Fatigue Criteria for Biaxial Loading of Notched Specimen in High-Cycle Region</b> Š. Major, Š. Hubálovský, V. Kocour and J. Valach	63
<b>Wiles of Using Hollow Specimens for Fatigue Tests</b> J. Papuga, M. Vargas and M. Růžička	71
<b>Digital Image Correlation as a Measurement Tool for Large Deformations of a Conveyor Belt</b> I. Petrikova, B. Marvalova, S. Samal and M. Cadek	77
<b>Development of Mechanical Properties of Cement Paste with Different Addition of Polyvinyl Alcohol</b> J. Topič, P. Tesárek, V. Nežerka, Z. Prošek and T. Plachy	81
<b>Experimental and Numerical Investigation of Critical Buckle Load of Composite Specimens</b> L. Bek, R. Kottner, J. Krystek and T. Kroupa	85
<b>Experimental and Numerical Study of Uniaxial and Multiaxial Stress-Strain Behaviour of R7T Wheel Steel</b> R. Halama, M. Šofer, F. Fojtík and A. Markopoulos	91

<b>Experimental Analysis and Numerical Modelling of Interphase Interfaces of New Environmental Low-Energy Composites</b>	95
M. Petrů, O. Novák, P. Lepšík and D. Myšáková	
<b>Experimental and Numerical Investigation of Sheet Metal Behavior under Cyclic Tension-Compression Loading</b>	99
J. Slota, M. Jurčišin, E. Spišák and I. Gajdoš	
<b>Mechanical Properties of New and Recycled PIM Feedstocks</b>	103
J. Huba, D. Sanétrník, E. Hnátková and B. Hausnerová	
<b>Influence of Combined Mean Stresses on Lifetime under High-Cycle Fatigue</b>	107
J. Janoušek, M. Balda and M. Chocholoušek	
<b>Effects of High Temperature Treatment on the Mechanical Properties of Basalt Fiber Reinforced Aluminous Composites</b>	111
M. Jögl, P. Reiterman, O. Holčapek and J. Kočátková	
<b>Micromechanical Properties of Spruce Tissues Using Static Nanoindentation and Modulus Mapping</b>	115
Z. Prošek, J. Topič, P. Tesárek, K. Indrová, V. Nežerka, P. Klapálek and V. Králík	
<b>Performance of Stabilized and Non-Stabilized PVA Nanofiber Textiles Subjected to Tension</b>	119
Z. Rácová, Z. Prošek, J. Topič, P. Tesárek, K. Indrová, V. Nežerka and P. Ryparová	
<b>Impact of Anisotropy on the Elastic Modulus of Basic Woven Fabric Structure</b>	123
D. Šimić Penava, Ž. Penava and Ž. Knežić	
<b>The Analyses of Pure Shear Behaviour of E-Glass Woven Fabrics by Picture Frame Test</b>	127
D. Šimić Penava, Ž. Penava and J. Krolo	
<b>A Semi-Analytical Prediction of Wear Rate of an Inductively Hardened Wheel Steel under Rolling Contact</b>	131
M. Šofer, R. Halama and R. Fajkoš	
<b>Experimental Study of Mechanical Behavior of HPL Composites</b>	139
M. Žaludek, S. Rusnáková, L. Fojtl and V. Rusnák	
<b>Stress-Controlled Fatigue Testing of E-Glass Epoxy Composite: Monitoring of Micro-Damage</b>	143
P. Měšťánek and V. Laš	

### **Chapter 3: Development of Experimental Methods of Analysis in Biomedical Engineering**

<b>Characteristics of PU Foam at Long Term Static and Dynamic Loading</b>	149
V. Fliegel and R. Martonka	
<b>About the Verification of External Fixators Applied in Traumatology and Orthopaedics</b>	153
K. Frydrýšek, F. Fojtík, O. Učeň, G. Theisz, V. Ječmínek, V. Bajtek, K. Čech Barabaszová, K. Dědková and J. Kukutschová	
<b>Effect of Polyvinyl Alcohol Concentration on the Mechanical Properties of Collagen/Polyvinyl Alcohol Blends</b>	161
J. Vesely, L. Horny, H. Chlup, M. Beran, M. Krajicek and R. Zitny	
<b>FEM Modelling and Experimental Analysis of Mechanical Properties of Artificial Blood Vessel</b>	165
J. Vosáhlo, O. Novák, M. Petrů and P. Lepšík	

### **Chapter 4: Methods and Means of Analysis the Static and Dynamic Loads of Mechanical Structures and Machines**

<b>Estimation of Crack Depth and Profile Using DCPD Method in Full Scale Railway Axle Loaded by Rotating Bending</b>	171
I. Černý	
<b>Static and Dynamic Experimental Stress-Strain Analysis of Axles Loaded by Rotation Bending</b>	175
I. Černý and M. Čipera	
<b>The Influence of Facet Size and Filtering on the Results of Strain Fields' Investigation Performed on Small Surfaces Using Digital Image Correlation</b>	179
M. Hagara, R. Huňady and M. Kalina	

<b>Identification of Coupled Mode Shapes Based on Complex Mode Indicator Function</b>	183
R. Huňady, M. Hagara and M. Schrötter	
<b>Creep Deformation of High Pressure Steam Turbine Part</b>	187
F. Straka, P. Albl and P. Pánek	
<b>Driver Seat Differential Pneumatic System with Air Damping</b>	191
O. Kohl, L. Pešík and A. Skarolek	
<b>Experimental Analysis of the Operational Loads on Agricultural Machine</b>	195
P. Šyrovátka and V. Dynybyl	
<b>Comparison of Various Means of Attachment of High Temperature Strain Gauge</b>	199
J. Cagáň, J. Rosa and F. Rösler	
<b>Experimental Determination of Wheel and Guiding Forces on the Tracks</b>	203
L. Pazdera, J. Smutny and L. Topolář	
<b>Damage and Localized Corrosion in Steam Turbines</b>	207
M. Černý	
<b>Development of the Bus Sandwich Roof Experimental and Numerical Approach</b>	211
K. Doubrava and C. Novotný	
<b>Analysis of the Operational Loading of the Strip Mine Conveyer Drive</b>	215
J. Václavík and P. Bohdan	
<b>Numerical Modelling and Experimental Measurement of Lifting Platform Construction for Car Relocation</b>	219
M. Petrů, P. Lepšík, O. Novák and A. Lufinka	
<b>Stress and Motion Analysis of Tram Gearbox Hinge</b>	223
M. Dub, J. Kolář, F. Lopot, V. Dynybyl and O. Berka	
<b>Measurement of Aircraft Propeller Dynamic Loading</b>	227
J. Rosa and J. Cagáň	
<b>Experimental Analysis of Gear Loading in Planetary Transmission</b>	231
O. Berka, F. Lopot and M. Dub	
<b>Analysis of the Tailgate Frame Composite Tube Mechanical Properties</b>	235
A. Lufinka and M. Petrů	
<b>Experimental and Numerical Investigation of Response of Sandwich Composite Beam Subjected to Low-Velocity Impact</b>	239
T. Mandys, V. Laš, T. Kroupa and R. Zemčík	
<b>Modal Parameter Analysis for Underdamped Mechanical Systems</b>	247
F.N. Nangolo and F. Klimenda	
<b>Vibroisolation of Vibratory Conveyors</b>	253
M. Pešík and P. Němeček	
<b>Experimental Tests and FEM Simulations of Flank Breakage on Tooth of Gears with Respect to Different Nitrided Depths</b>	257
K. Petr, V. Dynybyl and J. Křepela	
<b>Experimental and Numerical Analysis of Vibration of the Test Stand</b>	261
M. Petrů and L. Ševčík	
<b>Investigation of the Dynamic Behaviour of Fibres Using Simple Mechanical Systems</b>	267
P. Polach and J. Václavík	
<b>Use of MBD Programs in Solving General Unbalance Simple Mechanical System</b>	275
M. Svoboda, J. Soukup and A. Petrenko	
<b>Design and Implementation of Testing Stand for Gearboxes of Railway Vehicles</b>	283
J. Chmelař, K. Petr, V. Dynybyl and J. Křepela	
<b>Dynamic Operational Testing of Agricultural Trailer on a Testing Polygon</b>	287
P. Mossóczy, R. Uhlíř and P. Malý	
<b>Vibration and Noise Reduction Analysis of Sheet Metal Structures with Damping Layer</b>	291
J. Petřík, P. Kulhavý, M. Pašek and J. Šašek	
<b>Assessment of Reliability and Overall Life-Time of the Turbo Generator in the Kamýk Power Station</b>	297
P. Tej, A. Tejová and J. Marková	
<b>Assessment of Reliability and Overall Life-Time of the Turbo Generator in the Lipno Power Station</b>	301
P. Tej, A. Tejová and J. Marková	

<b>On the Performance of Single-Lap Bonded Joints with Embedded Optical Fibers</b>	305
M. Dvořák and M. Růžička	
<b>Failure Probability of Structure and its Model</b>	309
P. Kesl and F. Plánička	
<b>Probabilistic Verification of Structures with Respect to Durability</b>	313
J. Marková	

## **Chapter 5: New Methods of Researching and Designing in Structural Mechanics and Mechanics of Constructions**

<b>Non-Destructive Testing of Composite Gypsum Material Properties – Long Time Measurement</b>	
T. Plachy, T. Svoboda, J. Topič, Z. Prošek, V. Nežerka and P. Tesárek	321
<b>Probabilistic Parametrical Assessment of FRC Specimens</b>	325
M. Šolc and P. Brož	
<b>Non-Destructive Testing during the Hardening of Alkali-Activated Slag</b>	329
L. Topolář, P. Rypák, K. Samářková and P. Rovnaník	
<b>Experimental Evaluation of Tensile Forces in Short Steel Rods</b>	333
M. Polak and T. Plachy	
<b>Use of Digital Image Correlation to Track Strain Evolution in Compressed Masonry Piers</b>	337
J. Antoš, V. Nežerka and P. Tesárek	
<b>Flexural Strength of Float Glass</b>	341
P. Bouška, T. Bittner, M. Eliášová, M. Špaček, M. Vokáč and T. Mandlík	
<b>Experimental Verification of a Computing Model</b>	345
J. Melcer	
<b>Do we still Need an Experiment at All?</b>	349
S. Holý and Z. Hrubý	
<b>Dependence of Load Bearing Capacity on Homogeneity of Steel Fiber Distribution</b>	353
M. Rydval, P. Huňka and J. Kolísko	
<b>Finite Element Transient Dynamic Analysis of Laminated Composite Plates</b>	357
M. Žmindák, J. Soukup, L. Rychlíková and J. Skočilas	
<b>Effect of Distribution of Knots on the Strength of the Glued Laminated Timber Beams</b>	365
P. Klapálek and L. Melzerová	
<b>Methods of Non-Destructive Assessment of Timber</b>	369
P. Klapálek and L. Melzerová	
<b>Influence of Adhesive Type on Flexural Properties of Sandwich Structures</b>	373
L. Fojtl, S. Rusnáková, M. Žaludek and V. Rusnák	
<b>Characteristics of Fiber Reinforced Cementitious Composites in Dependence on Casting Direction</b>	377
J. Formůsek and M. Tvarog	
<b>To Monitoring the Degradation of UHPC Boards with Textiles Armatures</b>	381
M. Kostelecká	
<b>Creep of Cement Pastes with Content of Fly Ash one Year Old</b>	385
P. Paděvět and P. Bittnar	
<b>Determination of Permeability Properties of Concrete Surface Modified by CPF</b>	389
P. Reiterman	
<b>Compression Testing of Gypsum-Based Composite Reinforced by Recycled Wires from Automobile Tires</b>	393
P. Tesárek, L. Novák, J. Topič, Z. Prošek, V. Nežerka and M. Lidmila	
<b>Cohesion of Composite Reinforcement Produced from Rovings with High Performance Concrete</b>	397
T. Vlach, M. Novotná, C. Fiala, L. Laiblová and P. Hájek	
<b>Experimental Study of Primary Lining Tunnel Concrete after Thirty Years of Operation</b>	403
F. Vogel, R. Sovják, O. Holčapek, L. Mařík and J. Šach	
<b>Optimization of Fly Ash Properties for the Use in Cement and Concrete</b>	407
O. Zobal, P. Paděvět and V. Šmilauer	

**Estimation of Water Absorption Capacity of Hardened Concrete with Recycled Aggregate  
Based on Experimental Determination**

T. Pavlů and M. Šefflová

411

## **Chapter 6: Innovation in Teaching of Applied Structural Mechanics**

**New Ways of Teaching Statics and Applied Structural Mechanics to Architects**

M. Pospíšil, M. Vavrušková and E. Veřtátová

417