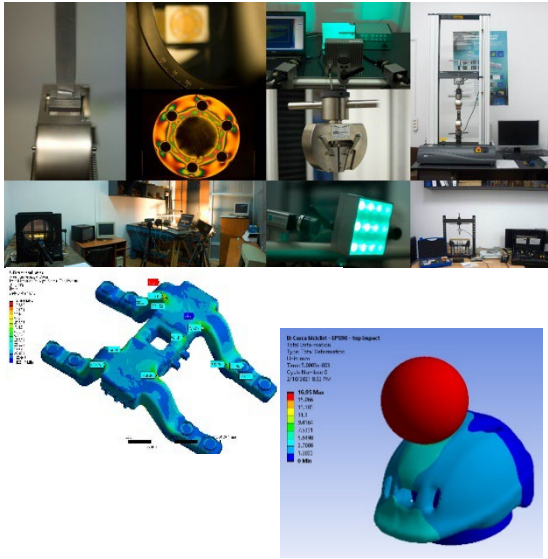


EXPERIMENTAL AND COMPUTATIONAL SOLID MECHANICS LABORATORY

Contact details

Name	Experimental and Computational Solid Mechanics Laboratory	
Acronym	ECSML	
Logo		
Site	https://ecsml.utcluj.ro/	
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Faculty Department	Faculty of Automotive, Mechatronics and Mechanical Engineering Department of Mechanical Engineering	
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Areas of expertise

Mechanical Characterization of Materials: Determination of mechanical and thermo-mechanical characteristics of materials using standard testing and equipment for metals, plastics, thermo-plastics, composites, additive manufacturing materials etc.

Experimental Stress and Deformation Analysis: Experimental determination of stress and deformation of structures using the Strain Gauge Technique and/or optical methods like 2D and 3D DIC (Digital Image Correlation), Moire, Photoelasticity and ESPI (Electronic Speckle Pattern Interferometry)

Thermo-Mechanical Simulation using Finite Element Analysis: Stress-strain analysis and deformation determination using ANSYS Workbench software for parts and assemblies under mechanical and/or thermal loads

3D Metrology: 3D scanning with the GOM Atos Core stereo camera measuring system with Blue Light Technology; GD&T report generation in reference to CAD and/or technical drawings using the GOM Inspect software

Team

Prof.PhD Habil. Mircea Cristian DUDESCU, Prof.PhD Habil. Mihaela SUCIU, Lect. PhD Adrian BOTEAN, Lect.PhD Radu CHIOREAN, Lect.PhD Mihaela SIMION, Lect.PhD Ioana RAD, Assistant PhD Cristian VILAU, PhD Laszlo RACZ, PhD. Eng. Adrian MURESANU, PhD. Stud. Eng. Theodor ZACH, PhD. Stud. Eng. Iulia SICOE

Representative projects

Coordinated projects

- ✓ Transilvania Digital Innovation Hub, project no. 1_EDIH/23.11.2023, MySMIS: 161789, subproject with company Napochim SA, Cluj-Napoca, 2024-2025.
- ✓ Smart buildings adaptable to the effects of climate change (CIA_CLIM), Complex Project carried out in RDI consortia (PCCDI30), coordinator UP Timișoara, 2018-2021/ P1 partner project management at UTC-N.
- ✓ Development of a special industrial machine for winding heavy-duty rotors, 2016-2017, Selenco Service SRL
- ✓ Thermoelectric actuation of structures specific to MEMS devices, 2024-2025, GNaC2023 ARUT.

Members of the research teams

- ✓ Research, design and development of environmentally friendly electric vehicles made of advanced composite materials, equipped with photovoltaic panels and construction of an assembly line in order to obtain the final product, 2021-2023, N-C-ST-202, National Technological Services Contract (N-C-ST) with Belco Avia
- ✓ New cement-based nanocomposite materials usable in 3D printing (CBN3D), PN-III-P4-4.1. ID-PCE 2021, 2021-2023,
- ✓ Advanced technologies for smart urban electric vehicles – URBIVEL, ID P_40_333, MySMIS: 105565, members of the research team under subsidiary contract no. 5 entitled "Research on a new concept of light suburban electric train", between UTC-N and SC REMARUL 16 FEBRUARIE SA and no.7 entitled "Design of the mechanical structure of a two-seater urban electric vehicle using advanced composite materials", between UTC-N and S.C. Belco Avia SRL, 2018–2021
- ✓ Development and testing of a new type of concrete with increased bending strength obtained by adding nanoparticles and organosilane, Experimental Demonstrative Project PN-III-P2-2.1-PED-125/ 2017-2018

Significant results

Articles in ISI rated journals, in the past 5 years (selection):

- ✓ Muresanu, A. D., & Dudescu, M. C. (2025). FEM Study on Enhancing Crashworthiness of Cylindrical Li-Ion Battery Packs Using Spacers Between the Cells. *Applied Sciences*, 15(5), 2720.
- ✓ Botean, A. I. (2025). Application of the DTM to the Elastic Curve Equation in Euler–Bernoulli Beam Theory. *Mathematics*, 13(16), 2647.
- ✓ Zach, T. F., Dudescu, M. C. (2024). The Three-Dimensional Printing of Composites: A Review of the Finite Element/Finite Volume Modelling of the Process. *Journal of Composites Science*, 8(4), 146.
- ✓ Muresanu, A. D., & Dudescu, M. C. (2024). Modelling of a Cylindrical Battery Mechanical Behavior under Compression Load. *Batteries*, 10(10), 353.
- ✓ Muresanu, A. D., Dudescu, M. C., & Tica, D. (2024). Study on the Crashworthiness of a Battery Frame Design for an Electric Vehicle Using FEM. *World Electric Vehicle Journal*, 15(11), 534.
- ✓ Racz, L., Dudescu, M. C. (2024). Numerical evaluation of the infill pattern upon mechanical proprieties of 3D printed materials. *Procedia Structural Integrity*, 56, 3-10.
- ✓ Rusu, M. M., Vilau, C., Dudescu, C., Pascuta, P., Popa, F., & Ardelean, I. (2023). Characterization of the Influence of an Accelerator upon the Porosity and Strength of Cement Paste by Nuclear Magnetic Resonance (NMR) Relaxometry. *Analytical Letters*, 56(2), 303-311.
- ✓ Dudescu, M. C., Racz, L., & Popa, F. (2023). Effect of infill pattern on fatigue characteristics of 3D printed polymers. *Materials Today: Proceedings*, 78, 263-269.
- ✓ Rusu, M. M., Vulpoi, A., Vilau, C., Dudescu, C. M., Pășcuță, P., & Ardelean, I. (2022). Analyzing the Effects of calcium nitrate over white Portland Cement: A multi-Scale approach. *Materials*, 16(1), 371.
- ✓ Cimpean, S. I., Burtea, A. L. C., Chiorean, R. S., Dudescu, M. C., Antoniac, A., Robu, A., ... & Timis, L. I. (2022). Evaluation of Bond Strength of Four Different Root Canal Sealers. *Materials*, 15(14), 4966.
- ✓ Muresanu, A. D., & Dudescu, M. C. (2022). Numerical and Experimental Evaluation of a Battery Cell under Impact Load. *Batteries*, 8(5), 48.
- ✓ Racz, L., & Dudescu, M. C. (2022). Numerical Investigation of the Infill Rate upon Mechanical Proprieties of 3D-Printed Materials. *Polymers*, 14(10), 2022.
- ✓ Cosma C, Teusan C, Gogola P, Simion M, Gabalcova Z, Trif A, Berce P, Balc N. (2022). Investigation of the Interface between Laser-Melted CoCr and a Stainless Steel Substrate, *Metals*, 12(6), pp. 965.
- ✓ Cosma Cosmin, Moldovan Mărioara, Simion Mihaela, Balc N., (2022) "Impact of laser parameters on additively manufactured cobalt-chromium restorations", *Journal of Prosthetic Dentistry*, vol. 128 (3), pp. 421-429
- ✓ Vilau, C., Dudescu, M.C. (2021): Impact Behaviour of Expanded Polystyrene by Experimental and Numerical Methods. *Acta Technica Napocensis - Series: Applied Mathematics, Mechanics, And Engineering*, 64(2).
- ✓ Leordean D, Vilău C, Dudescu M.C. (2021): Generation of Computational 3D Models of Human Bones Based on STL Data and CAD Software Packages. *Applied Sciences*. 11(17):7964.
- ✓ Bere, P., Dudescu, M., Neamțu, C., Cocian, C. (2021): Design, Manufacturing and Test of CFRP Front Hood Concepts for a Light-Weight Vehicle. *Polymers* 13(9): 1374.

The offer addressed to the economic environment

Research & development	✓ Mechanical characterization of materials – plastics and thermo-plastics, composites, additive manufacturing materials and structures, bacterial cellulose, dentistry fillers, adhesives and implants, coatings and micro-protective films for glass and lenses, foams for thermal insulation. ✓ Biomedical applications – implants, prostheses and equipment for rehabilitation, orthodontic wires & brackets, retention force measurement in facial paresis, suture strength. ✓ Experimental Stress Determination, Structural Stress and Deformation Measurement and Design cooperation with industrial partners
Consulting and access to research infrastructure	✓ Consulting, design, and research in the field of experimental and computational mechanics of solids and finite element simulations. ✓ Access to test laboratories with equipment for mechanical characterization of materials and various demonstrators of measuring systems based on different principles (both contact and optical) ✓ Static and dynamic testing equipment for mechanical characterization of materials – Young's Modulus, Poisson's Ratio, Yield and Ultimate Tensile Stress, Fatigue Testing, Impact Testing (Charpy), Micro-Hardness, Torsion. ✓ Equipment for 2D and 3D Digital Image Correlation, Fringe Projection, Photoelasticity, Electronic Speckle Pattern Interferometry, Stain Gauge Technique.
Training	✓ Basic design considerations for mechanical structures: yield and allowable stress, elasticity, load cases, geometrical characteristics of cross sections, optimization for efficient material usage, stability, rigidity and/or durability (cyclic loading). ✓ Using sensors and other experimental equipment for monitoring the mechanical behavior (stress level, deflection etc.) of structures and/or validating numerical models. ✓ Performing standalone static, dynamic, modal, buckling, thermal, and/or coupled analysis on structures using the finite element method. ✓ Measurement and inspection of geometrical parameters and/or tolerances of parts and assemblies using fringe projection (3D Scanning)