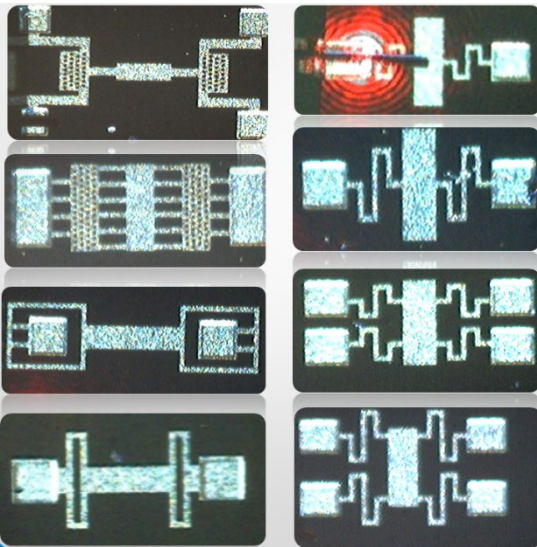



## MICRO - NANO SYSTEMS LABORATORY

### Contact details

Name	<b>Micro – Nano Systems Laboratory</b>	
Acronym	<b>MiNaS</b>	
Logo		
Site	<a href="http://minas.utcluj.ro/">http://minas.utcluj.ro/</a>	
Address	103-105 Muncii Av., 400641, Cluj-Napoca, Romania	
Faculty Department	<b>Faculty of Machine Building Mechanical Systems Engineering Department</b>	
Telephone	+40 264 202787	
Fax	+40 264 401660	
Director	<b>Prof. Dr. Eng. Marius Pustan</b>	
e-mail	<a href="mailto:Marius.Pustan@omt.utcluj.ro">Marius.Pustan@omt.utcluj.ro</a>	

### Areas of expertise

**Micro & Nano -systems**  
**Micro & Nano -mechanics**  
**Micro & Nano -tribology**  
**MEMS & NEMS, Microstructures and materials**  
**Adhesion, Friction, Fatigue, Reliability Design and Optimization**

### Team

**Prof. Dr. Eng. Marius Pustan**, Prof. Dr. Eng. Corina Birleanu, Prof. Dr. Eng. Cristian Dudescu, Dr. Eng. Violeta Merie, Math. Florina Maria Rusu, Eng. Radu Chiorean, Dr. Eng. Horea Crisan, PhDs Ionut Maries

### Representative projects

**MatSpaceTEG**, “High Performance Materials for the next generation Space Thermoelectric Generators”, Romanian Space Agency (STAR) 193/15.09.2017, 2017-2019  
**ROMECS**, Fabrication of a MEMS switch with robust metal contact, PN-III-P2-2.1-PED-2016-1727, (2016-2018)  
**multiDOF**, “Advanced Design of micromembranes with multiple degrees of freedom for optical MEMS applications”, PN-II-RU-TE-2014-4, 2015-2017  
**ROBOGRIP**, “Microgrippers as end-effectors with integrated sensors for microrobotics applications” MANUNET ERA-NET 22/ 2016, 2016-2018  
**NARDEMS**, “Nano mechanical and Nano tribological characterizations for reliability design of MEMS resonators”, PNII-RU-TE-2011, 2011-2014  
**3SMVIB**, “3 Scale modeling for robust-design of vibrating micro sensors”, ERA Net, 2012-2015  
**REDEMS**, “Reliability design of RF-MEMS switches for space applications, The Research, Development and Innovation Space Technology and Advanced Research”, Romanian Space Agency (STAR), 2012-2015  
**MEMSMAT**, “Tribomechanical Characterization of MEMS Materials for Space Applications under harsh environments”, Romanian Space Agency (STAR), 2013 – 2016

### Significant results

#### The most representative publications of the past 5 years:

1. M Pustan, C Birleanu, V Merie, S Garabagiu, D Marconi, L Barbu-Tudoran, R Voicu ” Thermal effect on mechanical properties of titanium oxide thin films for thermoelectric applications”, Symposium on Design, Test, Integration and Packaging of MEMS/MOEMS, DTIP 2019 – IEEE, 2019
2. C Birleanu, M Pustan, V Merie, MS Pop „Temperature Effect on Tribo-Mechanical Properties of Dental Materials”, 6th International Conference on Advancements of Medicine and Health Care through, Springer, Singapore, 2019
3. A Baracu, R Muller, R Voicu, C Tibeica, A Dinescu, M Pustan, C Birleanu „Microfabrication and experimental characterization of an out-of-plane MEMS switch”, Romanian Journal of Information Science and Technology, 22/2, pp 124-134, 2019
4. C Birleanu, M Pustan, F Serdean, V Merie, S Craciun „Temperature effect on pull-off force for gold cantilevers array”, IOP Conference Series: Materials Science and Engineering, 499/1, 2019
5. C Birleanu, M Pustan, M Merie, H Crisan „Effect of film thickness on the tribo-mechanical properties of chrome-gold thin films”, Proceedings of the Romanian Academy Series A – Mathematics, Physics, Technical Science, Information Science, 20/ 2, pp 174-183, 2019

6. F Șerdean, M Pustan, V Merie, C Birleanu, H Crișan „ Analysis of humidity influence on adhesion and tribological properties of niobium nitride thin films”, IOP Conference Series: Materials Science and Engineering, 499/1, 2019
7. V Merie, M Pustan, G Negrea, C Birleanu, F Șerdean „Temperature effect on the mechanical characteristics of niobium nitride thin films”, IOP Conference Series: Materials Science and Engineering, 499/1, 2019
8. C Birleanu, M Pustan, F Rusu, C Dudescu, R Muller, A Baracu A. „Relative humidity influence on adhesion effect in MEMS flexible application”, Journal Microsystem Technologies, Micro- and Nanosystems Information Storage and Processing Systems, ISSN: 0946-7076 (Print) 1432-1858 (Online), 2018
9. M Pustan, C Birleanu, C Dudescu, JC Golinval “Dynamical Behavior of Smart MEMS in Industrial Applications”, in book Smart sensors and MEMS: Intelligent devices and microsystems for industrial applications, Edited by S Nihtianov and A L Estepa, Woodhead Publishing Series in Electronic and Optical, 2017
10. M Pustan, C Dudescu, C Birleanu, F Rusu “Nanocharacterization of the Mechanical and Tribological Behavior of MEMS Micromembranes”, Book chapter in Nanomechanics, book edited by Intech, ISBN 978-953-51-3182-3, Print ISBN 978-953-51-3181-6, Published: May 24, 2017 under CC BY 3.0 license. 2017
11. V Merie, M Pustan, G Negrea “Atomic force microscopy analyses on metallic thin films for optical MEMS”, 5th International Conference on Powder Metallurgy and Advanced Materials, Book Series: Materials Research Proceedings, 8, pp 125-133, 2018
12. M Pustan, C Birleanu, C Dudescu “Nanocharacterization of the adhesion effect and bending stiffness in optical MEMS”, APPLIED SURFACE SCIENCE, 421, pp 191-199, 2017
13. M Pustan, R Chiorean, C Birleanu, Corina et al. “Reliability design of thermally actuated MEMS switches based on V-shape beams”, Microsystem Technologies-Micro-and Nanosystems-Information Storage and Processing Systems, 23/ 9, pp 3863-3871, 2017
14. M Pustan, C Dudescu, C Birleanu “Influence of the excitation modes on the resonators quality factor”, Romanian Journal of Information Science and Technology, 20/ 4, pp 342-353, 2017
15. C Birleanu, M Pustan, R Müller, C Dudescu, V Merie, R Voicu, A Baracu “Experimental investigation by atomic force microscopy on mechanical and tribological properties of thin films”, Int. J. of Mat. Res., 107, pp. 429 – 438, 2016
16. M Pustan, C Dudescu, C Birleanu “The effect of sensing area position on the mechanical response of mass-detecting cantilever sensor”, Microsystem Technologies, 21/ 9, pp 1827-1834, 2015.
17. M Pustan, C Dudescu, C Birleanu “Nanomechanical and nanotribological characterization of a MEMS micromembrane supported by two folded hinges”, Analog Integrated Circuits and Signal Processing, 82/ 3, pp 627-635, 2015
18. R Voicu, M Pustan, C Birleanu, A Baracu, R Muller “Mechanical and tribological properties of thin films under changes of temperature conditions”, Surface and Coatings Technology, 271, pp 48-56, 2015
19. F Rusu, M Pustan, C Birleanu, R Muller, R Voicu, A Baracu “Analysis of the surface effects on adhesion in MEMS structures”, J. Applied Surface Science, 358 Part B, pp 634-640, 2015
20. V Merie, M Pustan, G Negrea, C Birleanu “Research on titanium nitride thin films deposited by reactive magnetron sputtering for MEMS applications”, J. Applied Surface Science, 358 Part B, pp 525-532
21. C Birleanu, M Pustan M. “Analysis of the adhesion effect in RF-MEMS switches using atomic force microscope”, Analog Integrated Circuits and Signal Processing, 82/ 3, pp 571-581, 2015.

**Significant solutions:**

- Development of a new method to estimate the stiffness of micro/ nano -flexible structure by atomic force microscope
- Experimental determination of the energy dissipation in oscillating structure in order to increase the lifetime of vibrating sensors
- Design-Fabrication-Testing of reliable mass-detection sensors
- Design-Fabrication-Testing of micromembranes with high flexibility
- Software development for lifetime estimation of vibrating MEMS structures
- Advance nano-investigations of dental materials

**Products and technologies:**

- Micromembrane from optical and RF applications
- Paddle MEMS cantilevers for mass detection
- Electrostatically actuated resonator
- MEMS Software Development

**The offer addressed to the economic environment**

Research & development	<ul style="list-style-type: none"> <li>- Micro and Nano - Systems</li> <li>- Micro and Nano - Tribology</li> <li>- Micro and Nano - Mechanics</li> </ul> <p>Team members have great knowledge in: reliability design of micro and Nano systems, Nano /micro / macro tribological characterizations, experimental mechanics, material testing and numerical simulations. Due to a close collaboration with the productive sector, the research team is capable of collaboration with various industrial partners and research institutes. Already the laboratory is involved in collaborations with industrial partners, universities and research institutes from Romania, Belgium, Poland, Italy and France.</p>
Consulting	Consulting in any of the above mentioned fields can be done.
Training	The members of the team have a vast experience in the educational field (academics). Also, the team has experience in the development of the professional formation and reorientation trainings for engineers in the field of Micro and Nano system design, advance testing at Micro & Nano devices.