


## MECHATRONICS AND ENERGY LABORATORY

### Contact details

Name	<b>Mechatronics and Energy Laboratory</b>
Acronym	<b>LME</b>
Logo	 <p>Laboratorul de Mecatronică și Energie</p>
Site	<a href="http://mdm.utcluj.ro/Cercetare/Lab_ME/index.html">http://mdm.utcluj.ro/Cercetare/Lab_ME/index.html</a>
Address	103-105 Muncii Str., 400641, Cluj-Napoca, Romania
Faculty Department	<b>Faculty of Mechanical Engineering Mechatronics and Machine Dynamics Department</b>
Telephone	+40 264 401756
Fax	+40 264 415 490
Director	Prof. Dr. Eng. Radu Bălan
e-mail	<a href="mailto:radubalan@yahoo.com">radubalan@yahoo.com</a> <a href="mailto:Radu.Balan@mmfm.utcluj.ro">Radu.Balan@mmfm.utcluj.ro</a>



### Areas of expertise

**Materials, processes and innovative products:** Mechatronic systems, advanced industrial process control technologies, high precision mechanical products and technologies, advanced materials, innovative technologies for transportation. **Key words:** mechatronics, intelligent actuators, sensorial systems, advanced control, robotic systems;

**Computer science technologies:** Technologies for achieving high performance computing applications, opened, heterogeneous, scalable, fault tolerant and with a good connectivity between user and resources, artificial intelligence methods and systems. **Key words:** control algorithms, artificial intelligence, rapid control prototyping, human-machine interface systems;

**Energy:** Concepts, technologies and products that contribute to satisfy the energy needs at the lowest price, use of new energetic sources and improving the decisional process, increase of the technological competence and promotion of the knowledge transfer and technologies in energetic fields. **Key words:** energy efficiency, energy saving, renewable energy, control, sustainability, environment.

### Team

**Prof. Dr. Eng. Radu Bălan**, Prof. Dr. Eng. Vistrian Mătieș, Prof. Dr. Eng. Victor Hodor, Assist. Prof. Dr. Eng. Olimpiu Hancu, Assist. Prof. Dr. Eng. Ciprian Lăpușan, Assist. Prof. Dr. Eng. Sorin Besoiu, Assist. Dr. Eng. Radu Donca, Assist. Dr. Eng. Alin Pleșa

### Representative projects

**DEHEMS**, “Digital Environment Home Energy Management System”, European FP7 project, [www.dehems.eu](http://www.dehems.eu) (2008-2011)

“Research regarding advanced control in mechatronic applications”, PNII-Idei, [http://mdm.utcluj.ro/Proiecte/ID\\_1072/index.html](http://mdm.utcluj.ro/Proiecte/ID_1072/index.html) (2007-2010)

“Simulation, Control and Testing Platform with Applications in Mechatronics”, CEEX, <http://www.conmec.utcluj.ro/index-en.html> (2006-2008)

“Numerical analysis and control of the combustion instability using acoustic analogy”, IDEI, [http://www.termo.utcluj.ro/pncd2\\_2007\\_IDEI/](http://www.termo.utcluj.ro/pncd2_2007_IDEI/)

**E-FARM**, “Informatics support system for design, implementation and control for hybrid energy farms”, <http://www.automation.ro/e-farm/index.html> (2008)

**AMFM**, “Implementing the shape memory effect in mechatronic systems using advanced materials obtained by

powder metallurgy”, <http://www.cntp.ro:8083/pncdi2/program4/documente/2010/sedinta/rez/D7/72224.pdf>  
**MMFEH, "Design of an innovative hydro-pneumatic system by implementing the shape memory alloy effect using powder metallurgy technology"**, (2008)  
**"Design of a mobile multifunctional platform for inner water pipe inspection"**, (2012)  
**FlexForm, "Flexible professional forming program on mechatronic platforms"**, POSDRU, <http://www.flexform.ro/>  
**EQUATOR, "Advanced strategies for high performance indoor Environmental Quality in Operating Rooms"**, PN-II-PT-PCCA, (2011)

### Significant results

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

1. R. Bălan, J. Cooper, K. M. Chao, "Parameter identification and model based predictive control of temperature inside a house" in *Energy & Buildings*, vol. 43, 2011, pp. 748-758
2. R. Bălan, V. Muresan, R. Donca, "Human behavior changing based on the simulation of the temperature control of a house", in *ICREPQ'11 Conference*, 2011
3. D. Verdeş, S.-D. Stan, R. Bălan, M. Coman, "Study of design, kinematics and virtual control of 4 degrees of freedom parallel robot", in *Mechanika*, Nr.2(82), 2010
4. M. Coman, R. Bălan, "Video camera measuring application using Matlab" in *Solid State Phenomena*, vol. 166-167, 2010
5. Verdeş Dan, R. Bălan, "Kinematics analysis, Workspace, Design and Control of 3-RPS and TRIGLIDE medical parallel robots", in *Conference on Human System Interactions Location*, Catania, Italy, may 21-23, 2009
6. R. Bălan, V. Maties, S. Stan, "Optimization of the electrode control system using on line simulation and rule based control", in *IEEE International Conference on Mechatronics and Automations*, 2007, pp. 2939-2944
7. A. Bălan, R. Donca, C. Lapusan, M. Draghici, R. Bălan, "Smart Metering and Control for Home Energy Efficiency", in *Cd-Rom, Clima, Praga*, 2013

#### Significant solutions:

- The development of the Matlab-dSpace research platforms with HIL-Hardware in the Loop, SIL-Software in The Loop, RCP-Rapid Control Prototyping applications
- The implementation, testing and optimization of the modern/innovative control technics (state feedback control, optimal control, predictive control );
- The optimization of the motion laws (elimination of shocks)-Cartesian robot with pneumatic action, industrial control technology (SPC201, FPC101)
- Research on modeling and control of the energy consumption in buildings

**Patents:** 2

### The offer addressed to the economic environment

Research & development	Fundamental research in mechatronics, energy, renewable energy , integronics, trans-disciplinary as well as related fields Team members have great knowledge in mechatronics, energy, renewable energy and related fields. Thus the research base in process control, electronic parts and components design, software design (microcontrollers, DSP, FPGA, PLC etc.), embedded systems, mechanical design, energy efficiency, energy audit, energetic management, sensor network, management and control of industrial processes etc. is assured.
Consulting	Consulting in any of the fields above mentioned may be done Due to a close collaboration with the productive sector, the research team is capable of collaboration with various industrial partners in order to subcontract any applied engineering services and products.
Training	The members of the team are accredited trainers and 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 adults.