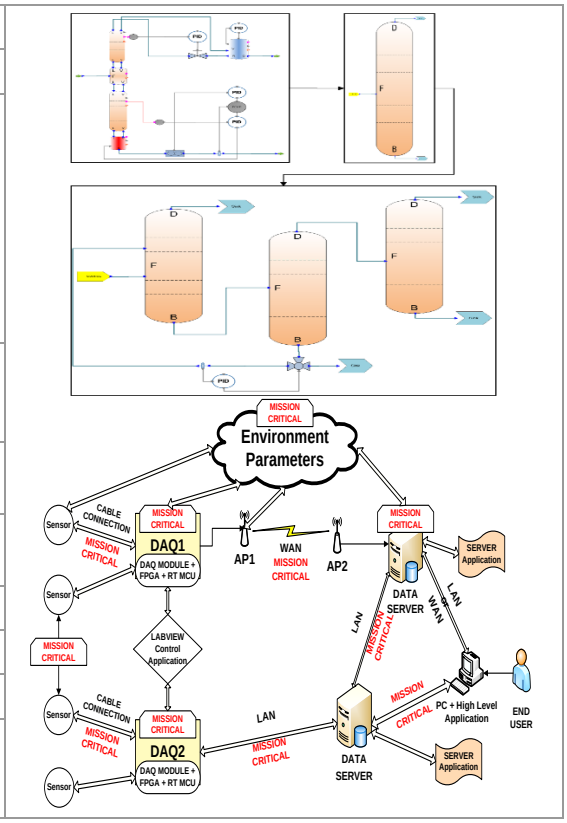
PROCESS AND ENERGY SYSTEMS ENGINEERING

Contact details

Name	**Process and Energy Systems Engineering**
Acronym	**PSE**
Logo	
Site	www.aut.utcluj.ro http://research.utcluj.ro/tl_files/research/Research%20Domain/Systems%20Engineering/3_Abrudean.pdf
Address	26-28 Gh. Bariţiu Str., 400027 Cluj-Napoca, Romania
Faculty Department	**Faculty of Automation and Computer Science** **Department of Automation**
Telephone	+40-264-202437
Fax	+40-264-599893
Director	Prof. Dr. Eng. Mihail Abrudean
e-mail	Mihai.Abrudean@aut.utcluj.ro



Areas of expertise

Process modelling and simulation
- First principle modelling
- Gray box modelling with partial derivative equations

Process control
- Plantwide control
- Control strategies for unconventional processes (e.g. cryogenic separation units, heavy water production)
- Development of control algorithms for processes with distributed parameters
- System identification technologies
- Dedicated control solutions for: rotary hearth furnaces, blunting systems, rolling mills, piercers and storage tanks

Energy systems
- Renewable energy systems
- Nuclear power plants
- Laser, plasma and electron irradiation processes
- Steam power plants

Medical systems
- Respiratory system
- Dental systems

Team

Prof. Dr. Eng. Mihail Abrudean, Assoc. Prof. Dr. Eng. Vlad Mureşan, Assist. Prof. Dr. Eng. Ionuţ Muntean, Assist. Prof. Dr. Eng. Iulia Clitan.

Representative projects

"Embedded mode for advanced pressure control in protected spaces", PNIII-CI-2017
"Optimizing the length of steel bars according to the process of programming the production of tubular material and in relation to the production process in the steel works" internal project funded by TUCN (2016-2017)
"Stimulation of the return curve (metallographic process)", internal project funded by TUCN (2016-2017)
I3E, "Promoting Innovation in the Industrial Informatics and Embedded Systems Sectors through Networking", South East Europe Transnational Cooperation Programme (SEE), (2010-2012)
"Advanced metallurgical process control for the production of seamless steel tubes", BD-CNCSIS, (2008-2010)

Significant results

The most representative publications of the past 5 years:

1. Unguresan, Mihaela-Ligia; Muresan, Vlad; Gligor, Delia; et al., Adsorption process of phenothiazine solution in dimethyl sulfoxide on graphite electrodes JOURNAL OF SOLID STATE ELECTROCHEMISTRY Volume: 22 Issue: 8 Pages: 2305-2314 Published: AUG 2018
2. Muresan, Vlad; Moga, Daniel; Petreus, Dorin; et al., Fault Detection and Fault Tolerance Mechanism for DC/DC Converters in Microgrids 10th IFAC Symposium on Control of Power and Energy Systems (CPES) Location: Meiji Univ, Nakano Campus, Tokyo, JAPAN Date: SEP 04-06, 2018 IFAC PAPERSONLINE Volume: 51 Issue: 28 Pages: 666-671 Published: 2018
3. Colosi, T.; Abrudean, M.; Muresan, V; et al., Extension of Mpdx matrix for 4th order partial differential equations with two independent variables 21st IEEE International Conference on Automation, Quality and Testing, Robotics (AQTR THETA) Location: Cluj Napoca, ROMANIA Date: MAY 24-26, 2018 Book Series: IEEE International Conference on Automation Quality and Testing Robotics Published: 2018
4. Muresan, Vlad; Abrudean, Mihail; Unguresan, Mihaela-Ligia; et al., Control of the Isotopic Exchange for O-18 Isotope Production 2018 IEEE 12TH INTERNATIONAL SYMPOSIUM ON APPLIED COMPUTATIONAL INTELLIGENCE AND INFORMATICS (SACI) Pages: 389-394 Published: 2018
5. Clitan, Iulia; Muresan, Vlad; Abrudean, Mihail; et al., Automatic Determination of Optimal Length of Casting Steel Blocks in the Context of an Imprecise Manufacturing 2017 21ST INTERNATIONAL CONFERENCE ON CONTROL SYSTEMS AND COMPUTER SCIENCE (CSCS) Pages: 99-105 Published: 2017
6. Bunta, Olimpia; Muresan, Vlad; Sas, Diana; et al., Mathematical Formalisms used in the Orthodontic Dynamics 2017 14TH INTERNATIONAL CONFERENCE ON ENGINEERING OF MODERN ELECTRIC SYSTEMS (EMES) Pages: 196-199 Published: 2017
7. Bunta, Olimpia; Muresan, Vlad; Sas, Diana; et al., Time and Space Constants in the Orthodontic Dynamics 14th International Conference on Engineering of Modern Electric Systems (EMES) Location: ORADEA, ROMANIA Date: JUN 01-02, 2017 Pages: 200-203 Published: 2017
8. D. Mitrea, S. Nedevschi, M. Abrudean, M. Lupsor-Platon, and R. Badea, "The Role of the Textural Microstructure Co-occurrence Matrices in the Automatic Detection of the Cirrhosis Severity Grades from Ultrasound Images", *Control Engineering and Applied Informatics*, vol. 18, pp. 96-106, Dec 2016
9. T. Coloşi, M. Abrudean, M.-L. Ungureşan, V. Mureşan, “Numerical simulation of distributed parameter processes”, *SPRINGER*, 2013, 363 pages.
10. T. Coloşi, M. Abrudean, M.-L. Ungureşan, V. Mureşan, “Examples of numerical Simulation for systems with distributed and lumped parameters through the Mpdx method with approximating solutions”, UTPRESS, Cluj-Napoca, Romania, 2013, 98 pages.
11. V. Mureşan, M. Abrudean, T. Colosi, C. Bondici, I. Clitan, M.L. Unguresan, M. Secara, “Modeling and Simulation of a Hydroelectric Process”, *6th International Conference on Aerospace, Robotics, Mechanical Engineering, Manufacturing Systems*, Neurorehabilitation and Human Motricities (ICMERA), 29-31 October, Bucharest, Romania, *Applied Mechanics and Materials*, vol. 811, 2015, pp. 133 -141, Trans Tech Publications, Switzerland.
12. V. Mureşan, M. Abrudean, M.-L. Ungureşan, T. Coloşi, “Feed-forward Control of a Residual Water Blunting Process”, *Journal of Control Engineering and Applied Informatics* (*CEAI*), vol. 16, no. 4, 2014, pp. 42-51.
13. V. Mureşan, M. Abrudean, M.-L. Ungureşan, T. Coloşi, “Cascade Control of a Residual Water Blunting System”, *Advances in Electrical and Computer Engineering* (*AECE Journal*), vol. 14, no. 2, 2014, pp. 135-144.

Significant solutions:

1. First principle modelling library for distillation processes with non-ideal mixtures, Tuning algorithm for P, ID controllers for discrete-time systems with dead time, Gray box modelling platform, Control strategies for isotopic processes, Plantwide control strategies for distillation processes, Tuning algorithms for coupled PID co, ntrollers for performance improvement

Products and technologies:

1. First principle modelling framework for distillation processes with non-ideal mixtures
2. General modelling and control framework using partial derivative equations
3. Robust PID tuning algorithm for discrete-time systems

The offer addressed to the economic environment

Research & development	Development of open- and closed-loop identification solutions. Development of tailored solutions for the modelling, simulation and control of chemical and energy systems. Development of general first principle modelling libraries/frameworks for chemical and energy systems. Development of general control strategies for the chemical and energy sector. Development of optimal control strategies for renewable energy systems. Development of models for biomedical applications.
Consulting	System identification. Process modelling. Tuning of coupled controllers. Calculation of the economic potential of implementing advanced control strategies. Support for the implementation of our proposed technical solutions.
Training	**Systems theory:** identification methods, stability analysis, control loops, controllers. **Process control:** optimal control algorithms, plantwide control, PID tuning (discrete and continuous systems), control of unconventional processes. **Electronics:** power and basic electronics.