# INTEGRATED CIRCUITS AND SYSTEMS GROUP

## Contact details

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| Name | **Integrated Circuits and Systems Group** |
| Acronym | **ICSG** |
| Logo |  |
| Site | http://www.bel.utcluj.ro/grup_csi |
| Address | 26-28 G. Baritiu Str., 400027, Cluj-Napoca, Romania |
| Faculty Department | **Faculty of Electronics, Telecommunications and Information Theory** <br> **Basis of Electronics Department** |
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## Areas of expertise

**Design of mixed analog/digital circuits for telecommunication systems**
The study and the development of some analog adaptive circuits, aimed for the practical realization of the "software defined radio" concept. The emphasis was the development of some reconfigurable filter architectures with programmable parameters, and their digital control with evolutionary methods.

**Design of low-power programmable analog/mixed-signal circuits for biomedical applications**
The development of some analog programmable circuits, aiming for bio-potential monitoring, bio-sensing and electro-stimulation of the human tissue. The emphasis was signal acquisition (amplification and artefact removal), signal processing (determination of the ECG or EMG morphology) and
correlation of the physiological measurements.

**Application of computational intelligence / deep learning techniques**
Development and implementations of applications based of computational intelligence / deep learning techniques:
analysis and design of some analog circuits; modelling (function fitting, pattern recognition, prediction); control applications; deep neural network implemented in Python.

**Optoelectronics and photonics with optical communications**
Applications with optical distributed sensors; Modelling and simulation of the special optical fibres (LMA, rare earth doped fibres); applications with optical biosensors based on plasmonic effect and fluorescence; optical integrated circuits modelling and simulation; photonic point-of care platforms with VR/AR capabilities; wearable devices based on embedded systems.

**Advanced design techniques of analog and digital integrated circuits**
The design of complex electronic circuit structures under the Mentor Graphics and Cadence design environment: reconfigurable circuits with applications in auditory prosthesis, transmission of the biomedical parameters over an electromagnetic link, radiofrequency receptors, low-power integrated circuits.

## Team

**Prof. Dr. Eng. Sorin Hintea,** Prof. Dr. Eng. Gabriel Oltean, Assoc. Prof. Dr. Eng. Ramona Galatus, Assist Prof. Dr. Eng. Gabor Csipkes, Assist Prof. Dr. Eng. Paul Farago, Assist Prof Eng. Lorant Szolga, Asist prof Emilia Sipos, Asist prof Laura Ivanciu, Assoc. Prof. Dr. Doris Csipkes, Asist prof Robert Groza, Asist prof Albert Fazakas, Assoc. Prof. Dr. Eng. Mihaela Cirlugea, Teacher Assistant, PhD student Adriana Potarniche

## Representative projects

ERANET-„ **Innovative Technological Approaches for validation of Salivary AGEs as novel biomarkers in evaluation of risk factors in diet-related diseases**" , UMF Cluj, https://salivages.wordpress.com/team/ (2018-2021)
**DAM-FU – "Intelligent hydro-dams behavior monitoring system through information fusion**", PN-III-CERC-CO-PTE-2016, 2016-2018.
**nSensOFWater – "Nano-Enabled Optical Fiber Biosensor Device with Smartphone Interface for Fast and Selective Detection of Antibiotics in Water",** PN-III-P2-2.1-PED-2016-0172, (2017-2018),
http://www.bel.utcluj.ro/~galatusr/PED67UEFISCDI.html
"**Design of a portable biomedical monitoring system with intelligent parameter control**", CICDI-2017, 2000/12.07.2017 (2017-2018)

StableNextSo – "Stable Next-Generation Photovoltaics: Unraveling degradation mechanisms of Organic Solar Cells by complementary characterization techniques" FP7-COST MP1307 (I), (2014-2018) link: https://www.cost.eu/actions/MP1307

PARTING -"Design of some integrated circuits for biomedical applications using evolutionary computation techniques" POSDRU/159/1.5/S/137516 „Parteneriat interuniversitar pentru excelenta in inginerie - PARTING"

"Design of analog reconfigurable circuits using evolutionary algorithms for fourth generation mobile communication terminals" (IDEI 657/2009-2011)

INTEREVISS – "Serviciu interactiv, in timp real pentru cresterea sigurantei publice in aglomerari urbane", PN-II-PT-PCCA-2013-4, 2014 (2014-2016).

"European Network for High Performance Integrated Microwave Photonics", HORIZON2020-COST-CA16220 (4 Oct 2017-3 Oct 2021), Link: https://www.cost.eu/actions/CA16220

"Advanced Fibre Laser and Coherent Source as tools for Society, Manufacturing and Lifescience", (10 Dec 2014-9 Dec 2018), HORIZON2020- COST-MP 1401 Link: https://www.cost.eu/actions/MP1401 ,

"Innovative methods in radiotherapy and radiosurgery using synchrotron radiation", HORIZON 2020-COST-TD1205- (21 May 2013-20 May 2017), Link: https://www.cost.eu/actions/TD1205/

## Significant results

The most representative publications of the past 5 years (2019-2015):

1. **Farago, P., Galatus, R., Hintea**, et al, An Intra-Oral Optical Sensor for the Real-Time Identification and Assessment of Wine Intake, SENSORS, Volume: 19 Issue: 21, Article Number: 4719, DOI: 10.3390/s19214719, NOV 2019
2. **R. Galatus, P. Farago**, et al, Distributed fluorescent optical fiber proximity sensor Towards a proof of concept, Spectrochimica Acta Part A-Molecular and Biomolecular Spectroscopy, vol. 198, pp. 7-18, 2018, ISSN: 1386-1425.
3. P. **Farago, R. Groza, S. Hintea**. High precision activity tracker based on the correlation of accelerometer and EMG data. 2019 42ND TSP Conference, JUL 01-03, 2019, Budapest, Hungary, pp. 428-431, ISBN:978-1-7281-1864-2
4. **P. Farago, R. Groza, L. Ivanciu, S. Hintea**. A Correlation-based Biometric Identification Technique for ECG, PPG and EMG. 2019 42ND TSP Conference, JUL 01-03, 2019,Budapest, Hungary,pp.716-719,ISBN:978-1-7281-1864-2
5. **Gabriel Oltean**, Victor Oltean, Horea Alin Balea, Method for Rapid Development of Arduino-based Applications Enclosing ANN, 45th Annual Conference of the IEEE Industrial Electronics Society, IEEE, Lisbon, Portugal, 14-17 Oct, 2019;
6. **Gabriel Oltean**, Camelia Florea, Radu Orghidan, Victor Oltean, Towards Real Time Vehicle Counting using YOLO-Tiny and Fast Motion Estimation , 25th International Symposium SIITME, IEEE, Cluj-Napoca, Romania, 23-26 October, 2019;
7. **Oltean, G, Ivanciu, Laura**, Implementation of a Fuzzy Logic-Based Embedded System for Temperature Control, IEEE 40th International ISSE2017, DOI: 10.1109/ISSE.2017.8001006, 10-14 May, Sofia, Bulgaria, 2017
8. **Oltean, G, Ivanciu, Laura**, Gordan, Mihaela, Stoian, I.,Kovacs, I., Predictive model for the horizontal displacement of a dam using autoregressive neural network, IEEE 21st International Conference INES 2017, Larnaca, Cipru, 20-23 octombrie, Electronic ISBN: 978-1-4799-7678-2 2017, 2017;
9. Blidar, A., Feier, B., Tertis, M., **Galatus, R.**, Cristea, C., Electrochemical surface plasmon resonance (EC-SPR) aptasensor for ampicillin detection, Anal Bioanal Chem (2019) 411: 1053. Doi: 10.1007/s00216-018-1533-5 (Impact factor= 3.28)
10. N Cennamo, F. Mattielo, **R. Galatus**, et al, Plasmonic sensing in D-shaped POFs with Fluorescent optical fibers as light sources, IEEE Transactions on Instrumentation & Measurement, Issue 4, April 2018, pp 754 - 759
11. C Cristea, M Tertis, **R. Galatus** -"Magnetic Nanoparticles for Antibiotics Detection, Nanomaterials 2017, 7(6), 119;
12. Cecilia Cristea, Florin Graur, **R. Galatus**, et al, Nanobiomaterials for Cancer Diagnosis and Therapy, INTERNATIONAL BOOKS- CHAPTER in "Nanobiomaterials: Applications in Drug Delivery, CRC Press, 2017
13. **Szolga, L. A.; Galatus, R.; Oltean, G.;** et al., Intrusion Detection System Based on Plastic Optical Fiber 2017 IEEE 23RD INTERNATIONAL SYMPOSIUM SIITME Pages: 403-408 Published: 2017

Diploma of Excellence and Medal Inventica 2019 - **Faragó Paul, Gălătuş Ramona-Voichiţa, Groza Robert-Gheorghe**, The XXIII International Exhibition of inventics „Inventica 2019", 26-28 June 2019, Iaşi, Romania.

Diploma and Silver Medal - **Faragó Paul, Gălătuş Ramona-Voichiţa, Groza Robert-Gheorghe**, Salonul Internațional de Invenții și Inovații "TRAIAN VUIA" Timișoara, 12-14 iunie, 2019, Romania.

## The offer addressed to the economic environment

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| Research & development | Analog, digital and mixed-signal VLSI integrated circuit design methods; Analysis, synthesis and design techniques for current-mode analog VLSI circuits; Evolutionary techniques used in the synthesis of VLSI electronic circuits; Application development with HDL languages (Verilog, VHDL); Design and implementation of digital systems with FPGAs; Application of computational intelligence / deep learning techniques; Synthesis of some analog digital and mixed signal integrated circuits up to mask layer, using the Mentor Graphics and Cadence VLSI design environment; |
| Consulting | Analog, digital and mixed-signal design, non-conventional design techniques: neural networks, deep neural networks, fuzzy systems, genetic algorithms; optical sensors and optoelectronic systems; electronic and optoelectronic systems for biomedical applications |
| Training | The Integrated Circuits and Systems Group offers instruction/training in the following domains: computer aided design of analog and digital circuits; computational intelligence / deep learning techniques; photonic sensors and biosensors, optoelectronic systems; electronic systems for medical applications. |

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