

Avviso di Seminario

ERASMUS+ KA107 International Credit Mobility

Mercoledì, 20 giugno 2018 – ore 11:00 – **Aula 8**

Prof. Dr. Zoran Jeličić

University of Novi Sad
Faculty of Technical Sciences
Novi Sad, Serbia

An introduction to optimal control theory

Abstract

The objective of this seminar is to familiarize students with the theoretical and numerical issues associated with deterministic optimal control problems and dynamic optimization. This lecture, on the one hand, provides the basic analysis tools for future research, while on the other hand, it provides insight into optimization techniques so that they can be effectively used for solving practical problems. The seminar includes the following topics:

- *Calculus of Variations* - Existence of a solution. Euler's equation. Sufficient conditions. Method of Lagrange multipliers for constrained extrema.
- *Optimal Control* - Pontryagin maximum principle (PMP). Hamilton-Jacobi-Bellman (HJB) equation.
- *Applications* - Applications of the theory, including optimal feedback control.



Short CV

Zoran D. Jeličić

Address:

University of Novi Sad
Faculty of Technical Sciences Novi Sad
Trg Dositeja Obradovića 6
21000 Novi Sad, Serbia
Phone: +381.21.485.2440
Phone: +381.21.485.2460
Mob: + 381 63 559450
E-mail: jelicic@uns.ac.rs

Working experience:

- 2013 – Present** Full Professor at the University of Novi Sad, Faculty of Technical Sciences, Department of Computing and Control
- 2012-Present** Head of Automation Control Group at the University of Novi Sad, Faculty of Technical Sciences, Department of Computing and Control
- 2008-2013** Associate Professor at the University of Novi Sad, Faculty of Technical Sciences
- 2008-2010** Director of Computing and Control Department, University of Novi Sad, Faculty of Technical Sciences
- 2003-2008** Assistant Professor at the University of Novi Sad, Faculty of Technical Sciences
- 2001** Researcher at Technical University Berlin
- 1995-2003** Teaching assistant at the University of Novi Sad, Faculty of Technical Sciences

Education:

University of Novi Sad, 1999 – 2003

PhD Thesis in Electrical Engineering and Computing: On Direct Methods of Calculus of Variations in Optimization of Nonlinear Control Problems.

University of Novi Sad, 1995 – 1999

MSc Thesis in Electrical Engineering and Computing: On Gauge Extended and Direct Methods in Continual Optimal Control Problems.

University of Novi Sad, 1990 – 1995.

BSc in Electrical Engineering and Computing

Teaching on University of Novi Sad

COMPUTING AND CONTROL

Undergraduate courses

- | | | |
|---|-------------------------|--------------|
| 1 | Methods of Optimization | V semester |
| 2 | Digital Control Systems | VII semester |

Master courses

- | | | |
|---|-------------------------------|------------|
| 3 | Adaptive and advanced control | I semester |
|---|-------------------------------|------------|

PhD courses

- | | | |
|---|--------------------------------------|--|
| 4 | Selected topics in optimization | |
| 5 | Selected topics in nonlinear control | |

MECHATRONICS

Undergraduate courses

- | | | |
|---|-------------------------|--------------|
| 6 | Methods of Optimization | VII semester |
|---|-------------------------|--------------|

SOFTWARE ENGINEERING AND INFORMATION TECHNOLOGIES

Undergraduate courses

- | | | |
|---|---|--------------|
| 7 | Nonlinear programming and evolutionary algorithms | III semester |
|---|---|--------------|

Teaching on SRH University Heildeberg, Germany

Master course

- | | | |
|----|------------------------------|-------------|
| 1. | Advanced Control Engineering | II semester |
|----|------------------------------|-------------|

Publications Textbook and one electronic textbook in the topic of control (both in Serbian language)

Supervision

Undergraduate	34 Undergraduate Honors Project Supervision
Graduate	38 Master of Science Thesis Supervision
	5 PhD Thesis Supervision

Research Projects:

Selected National Projects

1. Industry Automation in Energy Efficiency, 2002 - 2005.
2. Information and control system of water supply systems of major settlements, National Program of Planning, Protection and use of water in Serbia, 2004 - 2007.
3. Integrated management of energy flows in the NIS OIL Refinery Novi Sad, National Project in Energy Efficiency, 2005 – 2008, **Project coordinator: Dr Z. Jeličić**
4. Intelligent Supervising and Control System for Early Fault Detection and Isolation in Process Industry, 2011 – present, **Project coordinator: Dr Z. Jeličić**
5. Intelligent SCADA System for Energy Efficient Buildings, 2011- Present

More than 30 projects for Industry.

Selected International Projects

1. Alexandar von Humboldt project: Technische Universität Berlin, Effects of winglets on lift and drag, 2001.
2. Alexandar von Humboldt project: Technische Universität Berlin, Phase Diagrams and Interfacial Energies, 2003.-2004.
3. FP7, "Complex Power plants RObustification by fault Diagnosis, Isolation and Advanced Control Techniques", 2008-2011.
4. FP7, Cost-effective energy savings in healthcare buildings – Hospilot, 2009-2012.
5. Center of Excellence for Advanced and Intelligent Control. IPA *Cross-border collaboration project between Serbia and Hungary, 2013-2014. Project coordinator: Dr Z. Jeličić*
6. COST Project CA15225.2016 – ongoing. Participates as MC member.

Publications:

Selected Journal Publications

1. **Jeličić, Z. D.** Atanacković, T. M, On an optimization problem for elastic rods, *STRUCTURAL AND MULTIDISCIPLINARY OPTIMIZATION*, (2006) vol.32 No.1 pp. 59-64.
2. **Z. D. Jeličić**, T. M. Atanacković, Optimal shape of a vertical rotating column, *International Journal of Non-Linear Mechanics*, 42, (2007), 172 –179.
3. T. M. Atanackovic, Y. Huo, **Z. Jelicic**, I. Mueller, Phase diagrams modified by interfacial penalties, *Theoret. Appl. Mech.*, Vol.34, No.4, pp. 249-288, 2007.
4. **Z.D. Jeličić**, N. Petrovački: A Solution Scheme for Fractional Optimal Control Problems, *Structural and Multidisciplinary Optimization*, Springer, Volume 38, 571-581, Berlin, 2009
5. A. Pisano, M.R. Rapaić, **Z.D. Jeličić**, E. Usai, Sliding mode control approaches to robust regulation of linear multivariable fractional-order dynamics. *International Journal of Robust and Nonlinear Control*, Volume 20, Issue 18, pages 2045–2056, 2010.
6. M.R. Rapaić, **Z.D. Jeličić** , Optimal control of a class of heat diffusion systems. *Nonlinear Dynamics*, Vol 62, Number 1-2, 39-51, 2010.



7. Ž. Kanović, M.R. Rapaić, **Z.D. Jeličić**, Generalized Particle Swarm Optimization Algorithm - Theoretical and Empirical Analysis with Application in Fault Detection. *Applied Mathematics and Computation* 217(24) 10175–10186, 2011.
8. M. Petković, M.R. Rapaić, **Z.D. Jeličić**, A. Pisano, On-line adaptive clustering for process monitoring and fault detection. *Expert Systems with Applications*, 39(11) September 2012, 10226-10235.
9. Knežević A., Petković M., Mikov A., Jeremić-Knežević M., Demeši-Drljan Č., Bošković K., Tomašević-Todorović S., **Jeličić Z.D.**, Factors that predict walking ability with a prosthesis in lower limb amputees, *Srpski arhiv za celokupno lekarstvo*, 2016, VL – 144, 507- 513.
10. MN Kapetina, MR Rapaić, **ZD Jeličić**, Two-stage adaptive estimation of irrational linear systems, *AEU-International Journal of Electronics and Communications*, 2017 in press.

For more publications please consult

<https://scholar.google.com/citations?user=s9hsaH4AAAAJ&hl=en>

Awards

Technical solution “Self-Adaptive Process Monitoring System (SAMS)”, presented at NI Days, Belgrade 2013. Organized by National Instruments company awarded as the best in South-Eastern Europe.

Paper „Optimization of distributed order fractional PID controller under constraints on robustness and sensitivity to measurement noise“ presented at *International Conference on Fractional Differentiation and its Application* in Catania (Sicily, Italy) in 2014 co-authored with B. Jakovljević, M.R. Rapaić and T. B. Šekara awarded by Anatoly Kilbas Award.