ALEKSANDAR OBRADOVIĆ

Professor Dr. Aleksandar Obradović was born on July 31, 1962, in Užice, where he completed primary and secondary school. He graduated in 1987, acquired the Master degree in 1990 and the PhD degree in 1995 from the Faculty of Mechanical Engineering, Belgrade University. Prof. Dr. Josif Vuković, who had been a doctoral student of Prof. Dr. Veljko Vujičić, mentored his PhD. Since 1988 he has been employed at the Department of Mechanics, Faculty of Mechanical Engineering, where he has had all faculty appointments from assistant to full professor (2010). He became principal research fellow in MI SASA, mechanics, natural and mathematical sciences, since 2022. Professor Dr. Obradović is a member of Serbian Society of Mechanics and International Union of Theoretical and Applied Mechanics. He was elected a corresponding member of Serbian Academy of Nonlinear Sciences (April 5, 2018). His knowledge of English and Russian is good.

Research Interests: The areas of scientific- research work in the field of applied mechanics are optimal control of the mechanical system motion, dynamics of the system of rigid and elastic bodies, stability of the mechanical system motion, determination of the beam optimal shapes, and a smaller number of works related to the application of the vibration theory to engineering structures.

Scientific Results: By the end of 2022 he published 105 reviewed scientific papers, of which 42 in the M20 class journals. The most significant are journals of the M21a category: Composites Part B, Nonlinear Dynamics, Mechanical Systems and Signal Processing, Applied Mathematical Modelling, Applied Mathematics and Computation and Mathematics and Mechanics of Solids. He presented his paper 'Singular Control in Time Minimization of the System of Bodies Motion' at the Second International Conference of Nonlinear Sciences in Moscow, 1997, and guest stayed with RAS academician Vladimir Matrosov. The stay was realized on the recommendation of Prof. Dr. Veljko Vujičić.

The selected concrete scientific contributions in the field of application of the optimal control theory to mechanical systems:

- Determination of brachistochronic motions of nonholonomic rheonomic systems and variable-mass systems.

- Passive realization of brachistochronic motions by ideal constraints (by means of guides or by rolling of a moving on a nonmoving centroid).

- Brachistochronic motions of the point mass, Chaplygin's sleigh and vehicle for the case of restricted reactions of constraints.

- Determination of multiple solutions to the Maximum principle and determination of the global minimum in brachistochronic motion of holonomic systems.

- Application of the Miele method to optimal control by the motion of the system with 1DOF.

- Determination of the beam optimal shape of a limited inclination by applying the Minimum principle and the theory of singular optimal controls.

Response to Research Results: Dr. Obradović's works were cited, according to Google Scholar, 637 times, with h-factor 12 (February 2023). Number of citations according to SCOPUS, is 360, with h-factor 11. He is a reviewer of 7 scientific journals as well as of Mathematical Reviews/MathSciNet. At 4th International Congress of Serbian Society of

Mechanics 2013, he held a plenary lecture by invitation 'Constraint reactions in optimal control of mechanical systems'. The Yugoslav Society of Mechanics awarded him with the "Dr. Rastko Stojanović" prize for 1990 for the work 'Analysis of optimal control by the motion of rigid bodies in terms of time minimization'. He won the annual award of the Belgrade Chamber of Commerce in 2009 for technical improvement „Redesign and improvement of rotary excavators substructures of the mining basin Kolubara".

Educational activities: As an assistant, he held all forms of practice in the scientific field of Mechanics and "Mechanics of Robots" at undergraduate studies at the Faculty, and at the Centers in Užice and Military Technical Academy Žarkovo, as well as at the University "Nikola Tesla" Knin. As a professor he held all forms of lectures and practice in all teaching subjects of Mechanics at undergraduate studies at the Faculty and MTA Žarkovo, and lectured at postgradute and doctoral studies in "Selected chapters in mechanics", "Motion control of mechanical systems", "Small oscillations of bodies", "Oscillations of elastic bodies", "Oscillations in weapon systems" and "Oscillations of mechanical systems". Professor Obradović is a co-author of one basic and four auxiliary textbooks. The basic textbook by J. Vuković and A. Obradović: "Linear oscillations of mechanical systems" was published by the Faculty of Mechanical Engineering, 2007. He won the Best Book Award in 2007 at the Faculty. He has been praised and awarded several times by the Students' Union, and the acknowledgement of appreciation for the exceptional relationship with students and the commitment to teaching stands out. He mentored or co-mentored 4 doctoral dissertations, 2 master theses and was a member of a larger number of committees for defending PhD and MSc thesis at the Faculty of Mechanical Engineering in Belgrade and the Faculty for Mechanical and Civil Engineering in Kraljevo.

Organizational: Professor Obradović served as Vice-Dean for finances for two terms (2000 – 2004). He performed the duty of the president of the Commission for Publishing Activities, as well as the editor-in-chief of all Faculty's editions (2004-2014). He is the winner of the plaque on the occasion of the Faculty Day in 2004 for charity, contribution to the development of the Faculty and successful cooperation, and in 2018 for contribution to raising the reputation of the Faculty.

He is a member of the Editorial Board of TAM (Theoretical and Applied Mechanics) and Engineering Today. Professor Obradović participated in one international project and 8 national projects, as well as 10 projects of cooperation with the industry. He also participated in organizing a larger number of international and national conferences as a member of scientific or organizational committee. He is a member of the Supervisor Committee of Serbian Society of Mechanics and a member of the Parent Scientific Committee of the Ministry of Education, Science and Technological Development for mathematics, computer sciences and mechanics.

Contribution to Nonlinear Sciences: So far, Professor Dr. Obradović's basic scientific opus has been devoted to the application of mathematical theory of optimal control to mechanical systems, whose motion is described by nonlinear differential equations. In particular, research involved problems when control quantities belong to close sets and when on the system optimal trajectory there are singular segments connected with the segments when controls are on their boundaries.

A List of 5 Selected Research Publications

1. Šalinić S., Obradović A., Mitrović Z.,Rusov S., „*Brachistochrone with limited reaction of constraint in an arbitrary force field*", Nonlinear Dynamics, ISSN 0924-090X, Volume 69, No 1-2 (2012), 211-222
2. Obradović A., Šalinić S., Jeremić O., Mitrović Z., „*On the brachistochronic motion of a variable-mass mechanical system in general force fields*", Mathematics and Mechanics of Solids, ISSN: 1081-2865 , 2014, Vol. 19(4) 398–410
3. Obradović A.,Šalinić S., Grbović A., „*Mass minimization of an Euler-Bernoulli beam with coupled bending and axial vibrations at prescribed fundamental frequency*", Engineering Structures 228 (2021) 111538, ISSN: 0141-029Z.

4. Obradović A., Vuković J., Mladenović N., Mitrović Z., „*Time optimal motions of mechanical system with a prescribed trajectory*" , Meccanica ,ISSN 0025-6455,   (2011) 46, 803–816
5. Obradović A., Čović V., Vesković M., Dražić M.,*" Brachistochronic Motion of a Nonholonomic Rheonomic Mechanical System*", Acta Mechanica, ISSN 0001-5970, 214, 291–304 (2010)

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