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Overview of the International Workshop “Advanced Technologies in Material Science, Mechanical and Automation Engineering – MIP: Engineering - 2019”

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Overview of the International Workshop “Advanced Technologies in Material Science, Mechanical and Automation Engineering – MIP: Engineering - 2019”

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Abstract. The overview describes the main directions and results of the International Workshop MIP: Engineering-2019 held in Krasnoyarsk in April 4-6, 2019. It gives the details about the participants and the proceedings.

The Volume contains Proceedings of the International Workshop “Advanced Technologies in Material Science, Mechanical and Automation Engineering - MIP: Engineering-2019” which was held in Krasnoyarsk, Russian Federation in April 4-6, 2019 within the framework of the 24 International Scientific Open Conference “Modern Informatization Problems” (Yelm, WA, USA). Additionally, this volume includes the best reports accepted and presented at the Seventh International Workshop on Mathematical Models and their Applications (IWMMA 2018), which took place at the Krasnoyarsk Science and Technology City Hall in November 12-15, 2018.

The purpose of the Workshop MIP: Engineering-2019 is to share the results and prospects of the achievements in using advanced scientific, innovative and information technologies in materials science, mechanical, aerospace, chemical, ecological and power engineering, economics and organization of mechanical engineering production, automation engineering for industry 4.0, etc. IWMMA 2018 provided an international forum for the presentation of original results in mathematical modelling for software- and hardware applications in various fields of engineering, natural sciences, cybernetics, computer science, etc.

The Workshop MIP: Engineering-2019 was jointly organised by the International and Russian Union of Scientific and Engineering Associations (Moscow, Russia), Krasnoyarsk Regional Union of Scientific and Engineering Associations and Krasnoyarsk Science and Technology City Hall.

The main partner organisations in preparing and organising the Workshop in Krasnoyarsk as well as of the previous scientific events [1] were: JSC “Central Construction Bureau “Geophysics”, JSC “ISS-Reshetnev Company”, Siberian Federal University, Institute of Informatics and Telecommunications of Reshetnev University, Krasnoyarsk Scientific Centre of the Siberian Branch of the Russian Academy of Sciences.

The program of the Workshop consisted of keynote and plenary talks and numerous presentations (figure 1).





Figure 1. Plenary talks and sections.

The Program Committee and Editorial Board included prominent professors and scientists from the Russian Academy of Sciences, University of Maribor (Slovenia), Xingtai University (China), Ruhr University in Bochum (Germany), Siberian Federal University (Russia), Reshetnev Siberian State University of Science and Technology (Russia), Voronezh State Technical University (Russia) as well as specialists from Russian and foreign leading industrial enterprises.





Figure 2. Plenary talks and sections.

The international scope of the Workshop was confirmed by the participation of representatives from 14 countries besides Russia (Azerbaijan, Ukraine, Nigeria, Germany, USA, Kazakhstan, Vietnam, Pakistan, Saudi Arabia, China, Egypt, Uzbekistan, Slovenia and Finland):

- Academy of the Armed Forces of the Republic of Azerbaijan, Baku, Azerbaijan
- Azerbaijan National Academy of Sciences, Baku, Azerbaijan
- Azerbaijan State Oil and Industrial University, Azerbaijan
- Azerbaijan Technical University, Baku, Azerbaijan
- Donbass National Academy of Civil Engineering and Architecture, Donbass, Ukraine
- Donetsk National University, Donetsk, Ukraine
- Federal University of Agriculture, Nigeria
- Fraunhofer Institute for Industrial Mathematics ITWM, Germany,
- Gmbh Anvilex, Dresden, Germany
- Igor Sikorsky Kyiv Polytechnic Institute, Kyiv, Ukraine
- Institut für Stochastik, Universität Ulm, Germany
- Institute of Control System of Azerbaijan National Academy of Science, Baku, Azerbaijan
- National University of Sciences and Technology, Islamabad, Pakistan
- North Kazakhstan State University, Petropavlovsk, Kazakhstan
- Oles Honchar Dnipropetrovsk National University, Dnipropetrovsk, Ukraine
- Prince Sattam Bin Abdulaziz University, Riyadh, Saudi Arabia
- Republican Centre of Space Communication JSC, Kazakhstan
- Tabbin Institute for Metallurgical Studies, Cairo, Egypt
- Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, Tashkent, Uzbekistan
- Tashkent institute of railway engineering, Tashkent, Uzbekistan
- Tashkent university of Information technologies named after Muhammad al-Khwarizmi(TUIT), Uzbekistan
- Technische Universität Kaiserslautern, Fachbereich Mathematik, Germany
- University of Eastern Finland, Finland
- University of Maribor, Slovenia,
- University of Surrey, England
- Vietnam Maritime University, Vietnam
- Vietnam National University, Ha Noi, Vietnam
- Wuhan Textile University, Wuhan, China
- Wake Forest University, Winston-Salem, NC, USA

The participants from Russia represented more than 160 universities, scientific institutes and organisations, industrial enterprises:

- Altai State Agricultural University, Barnaul
- Altai State Technical University, Barnaul,
- Astrakhan State Technical University

- Baltic State Technical University «VOENMEH» named after D.F. Ustinov, Saint-Petersburg
- Bashkir state university, Ufa
- Bauman Moscow State Technical University (BMSTU), Moscow
- Bratsk State University, Bratsk
- Bryansk State Agrarian University
- Bryansk State Engineering Technological University
- Bryansk State Technical University
- Cheboksarskiy technical school of construction and urban development
- Chechen State University, Grozny, Chechen Republic
- Chelyabinsk State University, Chelyabinsk
- CJSC "Scientific-production center "Akvamarin", St. Petersburg
- Don State Technical University, Rostov-on-Don
- Energy Systems Institute of Siberian Branch of the Russian Academy of Sciences, Irkutsk
- Federal Guard Service Academy of Russian Federation, Oryol
- Federal Research Center - Krasnoyarsk Science Center of the SB RAS
- Federal research-and-production center of joint stock company 'Research-and-production association 'Mars', Ulyanovsk
- Federal Research Center «Computer Science and Control» of Russian Academy of Sciences, Moscow
- Financial University under the Government of the Russian Federation, Moscow
- GS Nanotech, Gusev
- Immanuel Kant Baltic Federal University, Kaliningrad
- Institute of Astronomy of the Russian Academy of Sciences, Moscow,
- Institute of Automation and Electrometry, Siberian Branch, Russian Academy of Sciences
- Institute of Biophysics SB RAS, Federal Research Center "Krasnoyarsk Science Center SB RAS", Krasnoyarsk
- Institute of Computational Modeling, Siberian Branch of Russian Academy of Sciences, Krasnoyarsk
- Institute of Economic and industrial Engineering Siberian Branch of Russian Academic of Science, Novosibirsk
- Institute of Market Problems at the Russian Academy of Sciences, Moscow
- Institute of Strength Physics and Materials Sciences, SB RAS, Tomsk
- Institute of Technical Chemistry of Ural branch of Russian Academy of Sciences, Perm
- Irkutsk National Research Technical University, Irkutsk
- Irkutsk State Transport University, Irkutsk
- Ivanovo State Polytechnic University
- Izhevsk State Technical University named after M.T. Kalashnikov, Izhevsk
- Joint-stock company "Scientific-production enterprise" Radar MMS ", St. Petersburg
- JSC "Krastsvetmet", Krasnoyarsk
- JSC «Izhevsk electromechanical plant «Kupol»
- JSC «Rosuniversalsnab», Kurgan
- K.G. Razumovsky Moscow State University of technologies and management, Moscow
- Kalashnikov Izhevsk State Technical University, Izhevsk
- Kaliningrad State Technical University
- Kaluga Branch of Bauman Moscow State Technical University, Kaluga
- Kaluga branch of Financial University under the Government of the Russian Federation
- Katanov Khakass State University, Abakan
- Kazan National Research Technical University named after A.N. Tupolev – KAI, Kazan, Republic of Tatarstan
- Kazan State Academy of Veterinary Medicine named after N.E. Bauman
- Kazan state energetic university
- Kemerovo State Agricultural Institute
- Kemerovo state university, Kemerovo,
- Kerch State Maritime Technological University, Kerch
- Khakas Technical Institute of Siberian Federal University, Abakan
- Kirensky Institute of Physics SB RAS, Krasnoyarsk, Russia
- Korolev Samara National Research University, Samara
- Krasnoyarsk branch of VNIRO («NIIERV»), Krasnoyarsk
- Krasnoyarsk housing and communal complex, Krasnoyarsk
- Krasnoyarsk Science and technology city hall

- Krasnoyarsk scientific and research institute of agriculture, SB RAS
- Krasnoyarsk State Agrarian University
- Kurgan state university, Kurgan
- LLC "Reaction Pipes", Togliatti
- Mechanical Engineering Research Institute of the Russian Academy of Sciences, Moscow
- Medical Institute Reaviz, Samara,
- Melentiev Energy System Institute, Irkutsk
- MIREA - Russian Technological University, Moscow
- Moscow Aviation Institute (National Research University), Moscow
- Moscow Institute of Physics and Technology (National Research University), Dolgoprudny
- Moscow Open Institute
- Moscow Polytechnic University, Moscow
- Moscow State Technological University STANKIN
- Moscow State University of Civil Engineering
- Moscow State University of Food Production, Moscow
- Moscow University of the Ministry of Internal Affairs of the Russian Federation n.a. V. Ya. Kikotya
- Murom Institute (branch) of Vladimir State University named after A.G. and N.G. Stoletovs
- National Research University of Information Technologies, Mechanics and Optics University ITMO, Saint Petersburg,
- National University of Science and Technology "MISiS", Moscow
- Nizhnekamsk Institute of Chemical Technology (branch) KNRTU
- Nizhniy Novgorod state engineering-economic university
- Nizhny Novgorod State Technical University, Nizhny Novgorod
- North-Caucasian State Academy, Cherkessk
- North-Caucasus Federal University, Stavropol
- Northern Trans-Ural State agricultural university, Tyumen
- Nosov Magnitogorsk State Technical University, Magnitogorsk
- Novgorod State Engineering-Economic University
- Novocherkassk Reclamation Engineering Institute named after A. K. Kortunov – affiliated branch of Donskoy State Agrarian University, Novocherkassk
- Novokubansk Branch of the Russian Scientific-Research Institute of Information and Technic and Economic Researches in Engineering and Technical Provision of Agricultural Complex, Krasnodar Region, Novokubansk
- Novosibirsk State Technical University
- Novosibirsk State University of Economics and Management, Novosibirsk
- Novosibirsk State University, Novosibirsk
- NRC "Kurchatov Institute" – CRISM "Prometey", St Petersburg
- OKB Fifth Generation Ltd., Novosibirsk
- Omsk State Technical University, Omsk
- Omsk Tank-automotive Engineering Institute
- Orel state University named after I. S. Turgenev, Orel
- Pacific National University, Khabarovsk
- Penza State Technological University
- Penza State University
- Penza State University of Architecture and Construction
- Perm Institute of the FPS of Russia
- Perm Military Institute of National Guard Troops of the Russian Federation
- Perm National Research Polytechnic University
- Perm State Agrarian-Technological University named after academician D N Prianishnikov
- Peter the Great St. Petersburg Polytechnic University, St. Petersburg
- Petrozavodsk State University
- Platov South-Russian State Polytechnic University (NPI), Novocherkassk
- Polzunov Altai State Technical University, Barnaul
- Research and development institute of construction physics RAASN, Moscow
- Research Institute-Republican Research Scientific-Consulting Center of Expertise, Moscow
- Reshetnev Siberian State University of Science and Technology, Krasnoyarsk
- RiK-Energo Ild, Ekaterinburg
- RiK-Energo Ltd, Chelyabinsk
- Rubtsovsk Industrial Institute (Branch) of Polzunov Altai State Technical University
- RUDN University, Moscow
- Russian Metrological Institute of Technical Physics and Radio Engineering

- Russian Presidential Academy of National Economy and Public Administration (Perm branch)
- Russian Technological University, Moscow,
- Ryazan State University named for S.Yesenin, Ryazan
- Saint Petersburg Mining University
- Saint Petersburg State Forest Technical University, Saint Petersburg,
- Saint Petersburg State University of Aerospace Instrumentation
- Saint Petersburg State University of Industrial Technology and Design
- Samara National Research University
- Samara Scientific Center of Russian Academy of Science, Samara
- Samara State Technical University
- Samara State Transport University, Saratov branch
- Saratov Socio-Economic Institute of Plekhanov Russian University of Economics
- Saratov state technical university named after Yu A Gagarin
- Sevastopol State University, Sevastopol
- Sholom-Aleichem Priamursky State University, Birobidzhan
- Shukshin Altai State University for Humanities and Pedagogy, Biysk
- Siberian Federal University, Krasnoyarsk
- Siberian State Industrial University
- Smolensk state agricultural academy
- South Ural Institute of Management and Economics, Chelyabinsk
- South Ural Scientific Center, Miass
- South Ural State University, Chelyabinsk
- State University of Management, Moscow
- Sternberg Astronomical Institute, Moscow
- Stock Company «Experimental Design Bureau «Electroavtomatika» named after P A Yefimov, Saint Petersburg
- SverdNIIhimmash JSC, Ekaterinburg
- T. F. Gorbachev Kuzbass State Technical University, Kemerovo
- Tambov State Technical University
- Testing and Technical Center – NPO PM, Zheleznogorsk
- Tobolsk Industrial Institute (TII) - branch of Tyumen Industrial University
- Togliatti State University, Togliatti
- Tomsk State University
- Tomsk State University of Control Systems and Radioelectronics
- Tver State Technical University
- Tyumen State University
- Ufa State Aviation Technical University
- Ufa State Petroleum Technological University
- Ural Federal University, Ekaterinburg
- Ural State Forest Engineering University, Ekaterinburg
- Ural State Law University, Yekaterinburg
- V.A. Trapeznikov Institute of Control Sciences of Russia Academy of Sciences, Moscow
- V.I. Vernadsky Crimean Federal University, Simferopol, Republic of Crimea
- Vladimir State University named after Alexander and Nikolay Stoletovs
- Volga Region State University of Service, Togliatti
- Volga State University of Technology, Yoshkar-Ola
- Volgograd State Technical University
- Volzhsky branch of Moscow automobile and road construction state technical university, Cheboksary
- Volzhsky Polytechnic Institute (branch) of the Volgograd State Technical University
- Voronezh Institute of High Technologies
- Voronezh Institute of the Federal Penitentiary Service of the Russian Federation
- Voronezh State Technical University
- Vyatka State University

The event has offered a platform for bringing together students, postdocs, innovative academics and industrial experts to exchange their ideas and contribute new engineering approaches to research mechanical and automation processes in various technological and information systems. Great interest was aroused by the section about cybernetics, economics and organization of mechanical engineering production. The direction stimulated lively discussions among researchers as well as industrialists.

The Workshop provided the premier interdisciplinary and multidisciplinary forum for researchers, practitioners and educators to present and discuss the most recent innovations, trends, concerns, practical challenges encountered and the solutions adopted in the fields of materials sciences, mechanical engineering, aerospace technologies, cybernetics, data protection in automation systems, chemical,

ecological and power engineering, etc. Although the schedule of the Workshop was very tight, there were very vivid discussions among the participants. The participants who could not come to the Workshop due to different reasons including the problem of high transportation costs presented on-site presentations which are available on the web-site of the Workshop.

A wide range of fundamental and applied problems in various production and technological systems has undergone consideration during the meeting. The programme of the Workshop included the following 5 sections:

- Material Science and Aerospace Technology.
- Mechanical and Automation Engineering for Industry 4.0.
- Chemical, Ecological and Power Engineering.
- Information Reliability and Data Protection in Automation Systems.
- Cybernetics, Economics and Organization of Mechanical Engineering Production.

All participants were invited to present their papers in this Volume and all submitted manuscripts went through the independent peer review process. We are very grateful to all reviewers from Russia, China, USA, Slovenia, Germany and Republic of Kazakhstan for their time and highly professional comments. We deeply believe that their reviews gave opportunity to improve the scientific quality of the presented papers which may be useful for academic, scientific and industrial partners.

More than 650 reports were submitted to the Organizing Committee of the Workshops MIP: Engineering-2019 and IWMA 2018 within the framework of the 24 International Scientific Open Conference “Modern Informatization Problems” (Yelm, WA, USA). 406 reports were selected for inclusion into this Volume after the review process. All the papers were subjected to rigorous peer-review by conference committee members and international reviewers. The papers were selected based on their quality and relevance to the Workshop directions. The proceedings present to the readers the recent advances in the field of material science, mechanical and automation engineering for industry 4.0, data protection in automation systems, cybernetics, information technologies, chemical, ecological and power engineering. These papers reflect modern engineering approaches in all Workshop directions.

We chose the IOP Conference Series: Materials Science and Engineering to provide all contributors with the opportunity to publish their papers in an international, peer-reviewed journal. This is understood and appreciated by all the participants of our Workshop, and therefore this Volume provides an excellent overview of the main topics of our Workshop.

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On behalf of the conference committee and organizers, we would like to thank all the authors who contributed to this Volume as well as to the reviewers, speakers and all the conference participants for their support to MIP: Engineering-2019.

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- [1] 2018 *IOP Conf. Ser.: Mater. Sci. Eng.* **450** 011001