

2020 V International Conference on Information Technologies in Engineering Education (Inforino 2020)

**Moscow, Russia
14 – 17 April 2020**



**IEEE Catalog Number: CFP20P31-POD
ISBN: 978-1-7281-4811-3**

**Copyright © 2020 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP20P31-POD
ISBN (Print-On-Demand):	978-1-7281-4811-3
ISBN (Online):	978-1-7281-4810-6

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

2020 V International Conference on Information Technologies in Engineering Education

Inforino 2020

Table of Contents

SESSION 1. Industry 4.0, Cybersecurity and Engineering Education

Pg. No.	Authors, Title	Session#_SeqOrder#
1	<i>A. Artemov, A. Ulanova, Y. Prudnikova</i> Practically-Oriented Approach to Training at the National Research University "Moscow Power Engineering Institute" in the Conditions of "Industry 4.0" and Its Problems	1_1
5	<i>T. I. Buldakova, A.V. Sokolova</i> Structuring Information about the State of the Cyber-Physical System Operator	1_2
10	<i>Almaz S. Duishembiev, Turatbek B. Duishenaliev, Danil R. Talipov</i> Virtualization of the Behavior of Structures From Rubber-like and Metal Composites	1_3
15	<i>Nadezhda Eyrikh, Ruslan Bazhenov, Tatiana Gorbunova, Natalia Markova, Aijarkyn Zhunusakunova</i> The Advantages of Using Computer Algebra System Maple in Learning Differential Equation	1_4
20	<i>Anna Glebova, Inna Lukashenko</i> Features of Teaching Economic Disciplines to Students of Engineering Specialties	1_5
26	<i>Dmitry Golubev, Sergey Belousov, Dmitry Kovalev</i> Training Specialists for Creating Digital Power Equipment	1_6
30	<i>Svetlana Kuzmicheva, Sergey Zapechnikov, Marina Kiryakina</i> A Technique of Protocol Construction for Detecting Compromise of Secret Keys	1_7
34	<i>Vitaly Martynov, Svetlana Makarova, Alena Zaytseva</i> Problems and Methods for Forming Educational Results in the Implementation of Engineering Education in the Digital Economy	1_8
39	<i>Vitaly Martynov, Elena Filsova, Alena Zaytseva</i> Information Architecture to Support Technical Education Training for Industry 4.0	1_9
45	<i>Sergey Mezin, Danila Dementev, Ekaterina Maximova</i> Development and Implementation of Regulators Based on Artificial Neural Networks in the Process of Training Specialists in Automated Control Systems	1_10
49	<i>Valeriy Ochkov, Konstantin Orlov, Julia Chudova</i> STEM in Engineering Education (KEYNOTE)	1_11
54	<i>Konstantin Orlov, Valeriy Ochkov, Sergey Gromov</i> Using "TBT Shell" Software for Online Testing in "Water Treatment" Education Course	1_12

59	<i>Ekaterina Pecherskaya, Dmitriy Artamonov, Maksim Safronov, Ekaterina Polosina, Irina Renzyaeva, Anastasia Shepeleva</i> Improving the Effectiveness of the Information Module for the Interaction between Universities and Employers	1_13
64	<i>Nidal El Sabayar Shevchenko, Larisa K. Ptitsyna, Mikhail P. Belov, Aleksey V. Ptitsyn</i> Formation of Individual Educational Trajectories in Preparing IT specialists	1_14
69	<i>Naeim Rezaeian, Galina Novikova</i> An Approach to Solve the Problem of Creating an Automatic Knowledge Control System Based on Text Analysis	1_15
75	<i>I. Rusakov, A. Rodin, M. Smirnova</i> Quality Engineering Education in the Context of Industry 4.0	1_16
80	<i>Ernesto Pacheco-Velazquez, Jaime Palma-Mendoza, Dimido Dewar Valdelamar</i> Learning Skills Development Through the Usage of Simulators	1_17

SESSION 2. Software and Information Support and Software for Engineering Education

	Authors, Title	Session#_SeqOrder#
86	<i>R.V. Alekhin, P.R. Varshavskiy, A.V. Kozhevnikov, P.A. Butyrin, F.N. Shakirzianov, M.V. Karpunina</i> Development of a Knowledge Base on the Topics of Theoretical Electrical Engineering Using Software Tools for Analysis and Generation of Collections of WIKI Articles	2_1
90	<i>Anastasia A. Bakulina, Olga E. Kondrateva, Oleg A. Loktionov</i> Software Package Development to Improve Occupational Safety at Electric Power Industry Enterprises	2_2
94	<i>A.V. Bobryakov, S.P. Yanukovich, K.V. Zakharchenkov, V.V. Borisov</i> A Method for Managing Engineers Training Processes using Swarm Intelligence Algorithms	2_3
98	<i>Otto Derzhavin, Elena Sidorova, Egor Vishnyakov, Tatiana Kudrina</i> The Construction of Simplified Models of a Multi-Timescale System on the Basis of Processes Implementations	2_4
104	<i>A.A. Emelyanov, O. V. Bulygina, N.Z. Emelyanova, E.S. Yashin</i> Simulation and Fuzzy Logic in Import Substitution Risk Management of High-Tech Equipment	2_5
108	<i>Alexander Ereemeev, Sergey Ivliev, Alexander Kozhukhov</i> Tool Environment for Creating Training Prototypes of Intelligent Decision Support Systems	2_6
112	<i>Alexander P. Ereemeev, Ilia A. Poliushkin, Nikolai A. Paniavin</i> Software Environment for Studying Intelligent Anytime Heuristic Search Methods	2_7
116	<i>Natalya N. Filatova, Konstantin V. Sidorov, Natalya I. Bodrina, Mark E. Voronkov, Pavel S. Klyuev</i> On One Method for Monitoring and Assessing Trainee's Cognitive Activity	2_8
120	<i>Katalina Grigorova, Kamelia Shoylekova-Nikolova</i> The Benefits of Mining Techniques in Digital Transformation of Engineering Education	2_9

125	<i>Pavel B. Khorev, Maxim I. Zheltov</i> Assessing Information Risks When Using Web Applications Using Fuzzy Logic	2_10
129	<i>Andrey Chernetsov, Pavel Khorev</i> The Problem of Ensuring Cross-Border Personal Data Transfer and Methods for Its Solving (KEYNOTE)	2_11
133	<i>Ivan Komarov, Andrey Vejera, Ali Zein, Svetlana Borisova, Svetlana Blazhenova, Aleksander Gavrilov</i> Design of Tree-Like Database Structure for Solving Test Modeling Taska of Energy Equipment Traning	2_12
137	<i>Sergei Kovalev, Anna Kolodenkova, Evgenia Muntyan</i> Educational Data Mining: Current Problems and Solutions	2_13
142	<i>Irina Kozmina, Denis Lukyantsev, Olga Musorina</i> Computer Adaptive Testing as an Automated Control of Students' Level of Preparadness Taking into Account their Individual Characteristics	2_14
146	<i>S.S. Kurbatov, I.B.Fominykh, A.B. Vorobyev</i> Applied Aspects of the Integrated Problem Solving System with Natural Language Interface	2_15
152	<i>V.A. Kurylev, M.V. Raskatova, A.S. Anisimov, P.V. Shchegolev</i> On Approach to Training in Methods of Software Working Out	2_16
157	<i>Viktoriiia Latypova, Vitaly Martynov, Anatolii Turganov</i> Decision Support System in Online Training Process Management for Implementing Complex Open Ended Assignments in Engineering Education	2_17
162	<i>V.S. Malyshev, E.V. Fedorova, A.M. Borovkova, V.A. Startsev</i> Education of Labor Protection and Environmental Engineering Specialists Based on Neural Network Data Processing Technology	2_18
166	<i>Mihkel M. Maran, Nikolai A. Paniavin, Iliia A. Poliushkin</i> Alternative Approaches to Data Storing and Processing	2_19
170	<i>A.Mokhov, V. Tolcheev</i> Automated Construction and Analysis of Scientific and Educational Profiles of the University Department	2_20
174	<i>Alexander V. Rechinskiy, Liudmila V. Chernenkaya, Vladimir E. Mager</i> System for Quality Assurance of Study Programs in the Area of Engineering Education	2_21
179	<i>Galina V. Rybina, Elena S. Fontalina</i> Some Aspects of Individual Approach to Learning Based on Tutoring Integrated Expert Systems	2_22
183	<i>Vladimir Sabanin, Vladimir Nesterenko, Andrei Repin</i> Methodological Support for Discipline Modeling Simulation Methods	2_23
187	<i>Vladimir Sabanin, Vladimir Nesterenko, Andrei Repin</i> Software for Training Process Discipline Simulation Methods	2_24
192	<i>Vadim A. Shakhnov, Andrey A. Glushko, Elena V. Rezchikova, Lyudmila A. Zinchenko, Vladimir V. Terekhov, Vladimir V. Makarchuk</i> TCAD and Cognitive Visualization in Electronic Engineering Education	2_25
196	<i>S.O. Smerchinskaya, N.P. Yashina</i> Program System "Decision-making: Procedures on Graphs"	2_26

200	<i>V. Spichak, S. Petrov</i> Experience in Designing and Developing the Educational Game BlockSolver	2_27
-----	---	------

SESSION 3. IT in Engineering Calculations and Design of Industrial and Energy Facilities

	Authors, Title	Session#_SeqOrder#
205	<i>Marina M. Alekseeva, Ivan I. Artyukhov, Vadim S. Alekseev</i> Engineering Calculation of Induction Crucible Furnace with MATLAB/Simulink	3_1
211	<i>Sergey Bogatenkov, Ruslan Bazhenov, Tatiana Gorbunova</i> Information-Measuring Systems Introduction: Engineering Education Information Support	3_2
217	<i>Chernenkii Andrei</i> Using of the Aerospace Modeling Simulator in the Educational Process	3_3
222	<i>Artem Chernukhin, Tatyana Savitskaya, Andrey Sverchkov, Alexander Egorov</i> Software Application for Research on the Organization of Cyclic Production of Multi-Assorted Products	3_4
226	<i>Natalia D. Chichirova, Yuri V. Abasev, Ilmira A. Zakirova</i> Digital technologies in the educational process of the Thermal Power Plant Department, Kazan State Power Engineering University	3_5
230	<i>Maksim Dli, Andrey Puchkov, Ekaterina Lobaneva</i> Engineering Study for Influence of Deep Neural Network Architectures on Images Recognition Quality	3_6
234	<i>L. Dorosinsky, N. Vinogradova, A. Sosnovsky</i> The Study of Computer Simulation as a Method of Cognition in the Teaching of Technical and Natural Sciences	3_7
238	<i>A.A. Filimonova, A.G. Filimonov, N.D. Chichirova</i> Study of Methods and Skill Experience of Diagnostics of the Main Heating Network State Diagnostics Using a Robotized Diagnostic Complex	3_8
242	<i>Yulia Geller, Yulia Shatskikh</i> Analysis of Free Software for Thermal Calculations	3_9
246	<i>George Grechin, Denis Shilin, Aleksandra Zayceva</i> Development of an Algorithm for Searching the Optimal Trajectory of the Object in the Conditions of Given Restrictions	3_10
250	<i>Victor Izhutkin, Alexander Zonov, Mikhail Zubov</i> Computer Model of the Reliability of the Communication between Nodes of a Wireless Sensor Network	3_11
254	<i>Dmitry Khokhlov, Mikhail Zaichenko, Kirill Sterkhov, Konstantin Pleshanov</i> Computational Model for High-Pressurized Heat Recovery Steam Generator Heat Transfer Study	3_12
259	<i>V. F. Kuzishchin, E. I. Merzlikina, V. S. Drobilko</i> Comparison of Different Variants of Regulators with Constant Speed Actuators Working with Low-Inertia Plants	3_13
263	<i>Sergey Kosarev, Andrey Gusev, Yuri Gusev, Dmitry Dobrokhotov, Ksenia Kolesnikova, Anna Peremyshcheva</i> The Use of National and International Standards in Developing CAD Models of Electrical Substations	3_14

267	<i>V. A. Loginov, A. A. Khvostov</i> Application of the Finite Element Method for Expanding the Capabilities of Educational Programs for Non-Destructive Testing of Industrial Facilities	3_15
271	<i>Alexandr Lubenchenko, Dmitry Ivanov, Denis Lukiantsev</i> Application of MatLab for Processing X-ray Photoelectron Spectroscopy Spectra	3_16
275	<i>Boris Margolis, Gubran Mansoor</i> Engineering Calculations of the Glass Annealing Process	3_17
279	<i>Rodion Maslov, Konstantin Pleshanov, Kirill Sterkhov, Dmitry Khokhlov</i> The Calculation and Study of Pipe Operation of Low-Pressure Circuit of Heat Recovery Steam Generators	3_18
283	<i>E.I. Merzlikina, O.G. Prochina</i> Laboratory Works on Control Theory Using Scilab/Xcos	3_19
287	<i>Anton Misnik, Vadim Borisov, Sergei Prokopenko, Sergei Krutalevich</i> Automation Methodology for Complex Technical-Organizational Systems	3_20
293	<i>Evgeniy Mladzievskiy, Elena Ryzhkova</i> The Use of Building Information Modeling Technology in Designing	3_21
297	<i>Hector Rafael Morano Okuno, Guillermo Sandoval Benitez, Virgilio Vasquez Lopez, Luis Villagomez Guerrero, Emmanuel Garcia Moran, Jose de Jesus Solis Cordova</i> Introducing Virtual Reality in an Automated Manufacturing Systems Course - First approach	3_22
302	<i>A. Nikitin, A. Belko, I. Zeylikovich, N. Babarika, S. Danilova-Tretjak, E. Evseeva, K. Nikolaeva</i> Numerical Models of Heat Conductivity of Composite Systems	3_23
307	<i>Jiri Pech, Milan Novak</i> Use Arduino and Micro:bit as Teaching Platform for the Education Programming and Electronics on the STEM Basis	3_24
311	<i>Sergei Prokopenko, Anton Misnik, Alexander Bobryakov, Vadim Borisov</i> Approaches to the Implementation of Information-Analytical Processes in Complex Technical-Organizational Systems	3_25
316	<i>Vladimir P. Radin, Olga V. Novikova, Elena V. Poznyak, Victor P. Chirkov, Oleg A. Babin, Sergey F. Kuznetsov</i> Matlab Application to Calculate Natural Oscillations of Beam Systems	3_26
321	<i>Rawad Deeb, D. Sidenkov</i> Investigation of a Flow Characteristics for Drop-shaped Tubes Bundle using Ansys Package	3_27
326	<i>Ivan Shcherbatov, Ekaterina Maximova, Danila Dementev</i> Applying of Modeling Tools Pack SimInTech in the Engineering Personnel Preparation for the Energy Sector	3_28
330	<i>V. S. Volgin, A.F. Ginevsky</i> Temperature Field Modeling Technique of a Thermoelectric Generator, Taking in Account Parasitic Internal Sources	3_29
334	<i>Krzysztof Wesolowski</i> Problems and Challenges in Education in ICT at the Poznan University of Technology (KEYNOTE)	3_30
338	<i>Dmitry Yemelyanov, Victor Toporkov</i> Coordinated Resources Allocation Heuristics in Distributed Computing	3_31

344	<i>V. P. Zverkov, T.V. Lukyanova, I. V. Putilova, N. S. Ivanova</i> Experience of Mastering Information Technologies by Qualified Users	3_32
-----	--	------

SESSION 4. IT in Educational, Research and Testing Laboratories

	Authors, Title	Session#_SeqOrder#
348	<i>D.I. Gataullin, R.R. Vildanov</i> About Possibility of Application of the Automated Systems of the Account of Energy Resources in Training and Research Programs	4_1
352	<i>S. Gerasimov, V. Glushnev, M. Panov</i> Model of Piezoelectric Transducers for the Metrological Characteristics Study of Ultrasonic Measuring Instruments	4_2
358	<i>D.S. Kalachev, S.V. Mezin</i> Modernization of Siemens SPPA-T3000 Laboratory with the Use of Real-Time Container	4_3
363	<i>O.M. Kapustina, A.I. Kobrin</i> Research on Mobile Manipulators Singular Kinematics by Computer Algebra Systems	4_4
367	<i>A. Kobzev, Y. Mishulin, A. Lekareva, O. Sidorova</i> Software Implementation of the Neural Network Controller in Systems with Complementary Correction of the Control Action	4_5
371	<i>G.S. Kuleshova, S.A. Yanchenko</i> Online Identification of Transformer Internal Faults Based on the Parameters of the Operating Mode	4_6
376	<i>A.B. Kuvaldin, M.A. Fedin, N.S. Nekrasova, A.O. Kuleshov, O.A. Polyakov, S.S. Kondrashov</i> Development of Software for the Automated Calculation Performance Induction Heating Gradient Blanks	4_7
381	<i>N. Leonov, Gvan Chun Cho, A. Poluektov</i> Short-circuit Currents from Wind Turbine Generators Study in Laboratory Workshop	4_8
386	<i>A.V. Lubenchenko, O.I. Lubenchenko, D.A. Ivanov, I.V. Ivanova, V.A. Iachuk, D.S. Lukiantsev</i> Acceleration of Monte Carlo simulation of Electron Transport	4_9
390	<i>V.A. Milyutin, A.A. Sukhikh, I.S. Antanenkova</i> The Use of Computer Modeling to Emulate Laboratory Work on the Study of Thermodynamic Properties of Substances	4_10
396	<i>S.K. Popov, V.D. Vaniushkin, A.A. Valineeva</i> Mathematical and Physical Modeling Cooling Process for Solid Waste Tire Pyrolysis Products	4_11
400	<i>M. Rudenkova</i> A Methodology of Modeling The IEEE 802.11 Wireless LAN Using ns-3	4_12
404	<i>M. Rumyantsev, D. Shumilin</i> Automated Complex for Researching High-speed Electric Turbomachines	4_13

408	<i>V. Shchugorev, V. Khromatov, A. Shchugorev, L. Sapunova</i> Innovative Technologies in the Estimation of Oscillation Frequencies of Composite Structures with the Use of Audio Recording Equipment in the Laboratory of Dynamics and Strength of Machines	4_14
413	<i>A. Shvetcov, V. Gorbunov, S. Dianov, K. Kinyakin</i> Intelligent Robotics in the Structure of the Direction "Information Systems and Technologies"	4_15
418	<i>A.A. Stoliarov, V.I. Kiselev, E.V. Kuznetsov</i> Virtual Laboratory of Electric Motor in the Discipline of "Electrical Engineering and Electronics"	4_16
422	<i>V.B. Tupov</i> Using the Data Scientist Experience in Training	4_17

SESSION 5. Distant Technologies and Electronic Educational Resources in Engineering Education

	Authors, Title	Session#_SeqOrder#
426	<i>E.K. Arakelyan, V.A. Rubashkin, A.V. Andriushin, S.V. Mezin</i> The Use of Modern Computer-Based Training-Simulator Complexes in the Educational Process	5_1
430	<i>Alexander Frolov, Alexander Vinnikov, Sofia Polyakova</i> Distant Modeling of NIZK Protocol for Public Keys Certification	5_2
435	<i>Alexander Frolov, Alexander Vinnikov</i> Modeling Cryptographic Protocols Using Computer Algebra Systems	5_3
439	<i>Valery Ochkov, Ilya Babichev, Michael Kirsanov</i> Graph Analysis for Thermal Networks	5_4
443	<i>Oksana Ladasha</i> Modern Media Technologies in Teaching German Language to STEM-Students	5_5
449	<i>Natalia Lyz, Alexander Lyz, Irina Neshchadim, Vitaly Kompaniets</i> Blended Learning and Self-Reflection as Tools for Developing IT-Students' Soft Skills	5_6
453	<i>Dmitry Merenkov, Sergey Shirinskii, Vladislav Korkin, Marina Zhokhova, Sergey Osipkin, Pavel Dergachev</i> E-Learning Resource for Electric Machine Design	5_7
457	<i>Liubov Yazykova, Inna Muzyleva, Anzhelika Martynova</i> Practical Aspects of Creating a Teacher's Information Space	5_8
461	<i>I. V. Putilova, M. P. Zhokhova, M. V. Shurkov, A. O. Gorbunova</i> Application of the Information and Communication Technologies in the Centre for Science and Education "ECOLOGY IN POWER ENGINEERING"	5_9
466	<i>Tatyana Shindina, Nina Knyazeva, Natalya Usmanova, Nina Orlova</i> E-Learning: Experience and New Challenges	5_10
470	<i>Igor Andrianov, Alexey Sukonschikov, Anatoly Shvetsov, Svetlana Rzhetskaya, Anna Sergushicheva, Dmitry Kochkin</i> The Architecture of Intelligent Agent-Based Educational System for Training Students in a Technical University	5_11

476	<i>Elena Dudysheva, Olga Solnyshkova</i> Mobile Technologies in Blended Learning of Engineering Students in Digital Measurements on Geodetic Equipment	5_12
481	<i>Anton Sutchenkov, Anton Tikhonov</i> Embedding Interactive Python Web Applications into Electronic Textbooks	5_13
485	<i>Andrey Sverchkov, Pavla Mikhaylova, Tatiyana Savitskaya, Dinara Il'murzayeva</i> Multimedia Academic Manual "Database Application Development"	5_14
491	<i>A.V. Trofimov, A.M. Polyakov, V.A. Trofimov</i> Interactive Educational Complex on the Basics of "Digital Substation" Technology	5_15

SESSION 6. Computer Graphics and 3D Modeling in Engineering Education

	<i>Authors, Title</i>	<i>Session#_SeqOrder#</i>
495	<i>Linda Margarita Medina Herrera, Diamandina Glaros, Marlen Aguilar Abalo</i> MATHPOL: Development of Mathematical Competencies in Engineering Students Using Project-Oriented Learning	6_1
500	<i>Andrey Ivashchenko, Tatyana Kondrat'eva, Oleg Polyakov</i> Forming of Curvilinear Structures Based on Polyhedrons by the Projectivographical Method	6_2
504	<i>Natalia V. Kaigorodtseva, Nadejda U. Simak, Roman S. Simak, Mikhail I. Mashkarin, Dilnoza A. Achilova, Dilarom F. Kuchkarova</i> Quality Control of Training in Engineering and Computer Graphics	6_3
508	<i>Elena P. Kasatkina, Vladimir A. Sukhoverhiy, Yevgeniy Y. Chakheev, Dmitriy Y. Ivannikov</i> Testing System for Graphic Disciplines	6_4
512	<i>Alexander L. Kheifets</i> Chasles' Theorem as a 3D Analogue of Pascal's Theorem	6_5
517	<i>N.V. Ozerova, A.A. Zavyalova, I.V. Korolev, N.V. Zvonkova, A.V. Sidorenko</i> Using Visualization in the Educational Process in the Direction of Environmental Protection	6_6
522	<i>A.M. Peremyshcheva, D.N. Asainov, M.V. Burmeyster</i> Improving Laboratory Work on Switching Devices through the Use of 3D-Visualization of a Heavy-Duty Circuit Breaker Model	6_7
526	<i>Olga Pichkaleva, Irina Stolbova, Alevtina Shakhova</i> Actualization of Graphic Training on the Basis of Design Activity	6_8
530	<i>Andrey Taratorin, Ainur Mukhametov</i> Usage of 3D Modeling in Engineering Education on the Example of the Noise Silencers Development	6_9
534	<i>Andrey Zakharov, Yulia Zakharova</i> The Use of Computer Graphics in the Study of the Geometric Modeling Course	6_10
539	<i>N.V. Zhuk, L.V. Ermakova, E.P. Kasatkina, O.I. Isaeva, Y.Y. Chakheev</i> The Use of Digital Technologies in Teaching a Foreign Language	6_11