

Volume 62 of PROCEEDINGS includes the papers presented at the scientific conference RU & SU'23, organized and conducted by University of Ruse "Angel Kanchev" and the Union of Scientists - Ruse. Series 2.1. contains papers reported in the Mechanical Engineering and Machine-Building Technologies.

Book	Code	Faculty and Section
Agrarian and Industrial Faculty		
1.1.	FRI-8.303b-1-AMT&ASVM	Agricultural Machinery and Technologies, Agrarian Science and Veterinary Medicine
	FRI-1.202-1-MR	Maintenance and Reliability
	FRI-9.2-1-THPE	Thermal, Hydro- and Pneumatic Equipment
	FRI-19.206-1-EC	Ecology and Conservation
	FRI-16.203-1-ID	Industrial Design
1.2.	THU-SSS-AMT&ASVM	Agricultural Machinery and Technologies, Agrarian Science and Veterinary Medicine
	THU-SSS-MR	Maintenance and Reliability
	THU-SSS-THPE	Thermal, Hydro- and Pneumatic Equipment
	THU-SSS-EC	Ecology and Conservation
	THU-SSS-ID	Industrial Design
Faculty of Mechanical and Manufacturing Engineering		
2.1.	FRI-1.317-1-MEMBT	Mechanical Engineering and Machine-Building Technologies
2.2.	TUE-1.417-SSS-MEMBT	Mechanical Engineering and Machine-Building Technologies
Faculty of Electrical Engineering Electronics and Automation		
3.1.	FRI-10.326-1-EEEA	Electrical Engineering, Electronics and Automation
3.2.	FRI-2G.303-1-CCT1	Communication and Computer Technologies 1
	FRI-2G.302-1-CCT2	Communication and Computer Technologies 2
3.3.	THU-10.326-SSS-EEEA	Electrical Engineering, Electronics and Automation
	THU-2G.303-SSS-CCT	Communication and Computer Technologies
Faculty of Transport		
4.1.	FRI-KC.H2-1-TMS	Transport and Machine Science
	SAT-KC.H2-1-TMS	Transport and Machine Science
4.2.	FRI-20.21-2-SITSTL	Sustainable and Intelligent Transport Systems, Technologies and Logistics
4.3.	MON-5.21-SSS-TMS	Transport and Machine Science
Faculty of Business and Management		
5.1.	FRI-2B.412-1-EM1	Economics and Management 1
	FRI-2G.404-1-EM2	Economics and Management 2
	SAT-2B.412-1-EM1	Economics and Management 1
5.3.	THU-2G404-SSS-EM	Economics and Management
5.4.	FRI-2G.510-1-ESIS1	European Studies and International Security 1
	FRI-2G.510-1-ESIS2	European Studies and International Security 2
8.2.	FRI-1.322-1-SW	Social Work
Faculty of Natural Sciences and Education		
6.1.	FRI-1.414-MIP	Mathematics, Informatics and Physics
6.2.	FRI-2G.305-1-PP	Pedagogy and Psychology
6.3.	FRI-2G.309-1-LL	Linguistics and Literature
	FRI-12.23-1-AS	Art Studies

6.4.	FRI-2G.307-1-ERI	Education - Research and Innovations
	SAT-2G.307-1-ERI	Education - Research and Innovations
6.5.	FRI-1.407-SSS-PP-01	Pedagogy and Psychology
6.6	FRI-2G.308-SSS-LLA	Linguistics, Literature and Art Science & History, Ethnology and Folklore
6.7	FRI-2.203-SSS-MIP-01	Mathematics, Informatics and Physics
Faculty of Law		
7.1.	FRI-2B.313-1-L	Law Studies
	SAT-2B.313-1-L	Law Studies
7.2.	FRI-2B.312-1-NS	National Security
7.3.	WED-2B313-SSS-L	Law Studies
Faculty of Public Health and Health Care		
8.1.	FRI-2K.201-1-HP	Health Promotion
8.3.	FRI-2G.104-1-HC	Health Care
8.4.	FRI-2G.309-1-MCDA	Medical and Clinical Diagnostic Activities
8.5.	THU-K.101-SSS-HP	Health Promotion
	THU-2.101-SSS-HC	Health Care
	THU-2Г.105-SSS-MCDA	Medical and Clinical Diagnostic Activities
Quality of Education Directorate		
9.1.	FRI-2.104-1-QHE	Quality of Higher Education
Razgrad Branch of the University of Ruse		
10.1.	FRI-LCR-1-CT(R)	Chemical Technologies
	FRI-LCR-P-1-CT(R)	Chemical Technologies (Poster session)
10.2.	FRI-LCR-1-BFT(R)	Biotechnologies and Food Technologies
	SAT-LCR-P-1-BFT(R)	Biotechnologies and Food Technologies (Poster session)
10.3.	TUE-SSS-BFT(R)	Biotechnologies and Food Technologies
	TUE-SSS-CT(R)	Chemical Technologies
Silistra Branch of the University of Ruse		
11.1.	FRI-110-1-PPM(S)	Pedagogy; Psychology and Methodology of training in...
	FRI-229-1-P(S)	Philology
	FRI-216-1-TS(S)	Technical Sciences
11.2.	FRI-239-I-PMT(S)	Pedagogy and Methodology of Training in...
	FRI-229-I-H(S)	Humanities
	FRI-216-I-TS(S)	Technical Sciences

The papers have been reviewed.

ISSN 1311-3321 (print)

ISSN 2535-1028 (CD-ROM)

ISSN 2603-4123 (on-line) Copyright © authors

The issue was included in the international ISSN database, available at <https://portal.issn.org/>.

The online edition is registered in the portal ROAD scientific resources online open access

PROGRAMME COMMITTEE

- **Prof. Amar Ramdane-Cherif**
University of Versailles, France
- **Assoc. Prof. Manolo Dulva HINA**
ECE Paris School of Engineering, France
- **Prof. Leon Rothkrantz**
Delft University of Technology, Netherlands
- **Assoc. Prof. Antonio Jose Mendes**
University of Coimbra, Portugal
- **Prof. Ville Leppanen**
University of Turku, Finland
- **Assoc. Prof. Marco Porta**
University of Pavia, Italy
- **Prof. Douglas Harms**
DePauw University, USA
- **Prof. Zhanat Nurbekova**
L. N. Gumilyov Eurasian National University, Nur Sultan, Kazakhstan
- **Prof. Mirlan Chynybaev**
Kyrgyz State Technical University, Bishkek, Kyrgyzstan
- **Prof. Ismo Hakala, PhD**
University of Jyväskylä, Finland
- **Prof. Artur Jutman, PhD**
Tallinn University of Technology, Estonia
- **Prof. RNDr. Vladimir Tvarozek, PhD**
Slovak University of Technology in Bratislava, Bratislava, Slovakia
- **Assoc. Prof. Ing. Zuzana Palkova, PhD**
Slovak University of Agriculture in Nitra, Nitra, Slovakia
- **Andrzej Tutaj, PhD**
AGH University of Science and Technology, Krakow, Poland
- **Prof. Valentin NEDEFF Dr. eng. Dr.h.c.**
"Vasile Alecsandri" University of Bacău, Romania
- **Cătălin POPA, PhD**
"Mircea cel Bătrân" Naval Academy, Constantza, Romania
- **Prof. dr Larisa Jovanović**
Alfa University, Belgrade, Serbia
- **Prof. dr hab. Edmund LORENCOWICZ**
University of Life Sciences in Lublin, Poland
- **Assoc. Prof. Ion MIERLUS - MAZILU, PhD**
Technical University of Civil Engineering, Bucharest, Romania
- **Prof. Dojčil Vojvodić PhD**
Faculty of Philosophy, University of Novi Sad, Serbia
- **Prof. Alberto Cabada**
University of Santiago de Compostela, Faculty of Mathematics, Santiago de Compostela, Spain
- **Kamen Rikev, PhD**
Institute of Slavic Philology, Maria Curie-Skłodowska University in Lublin, Poland
- **Prof. Ricardo Gobato, PhD**
Secretariat of State of Paraná Education and Sport (SEED/PR), Laboratory of Biophysics and Molecular Modeling Genesis
- **Prof. Fatima Rahim Abdul Hussein, PhD**
University of Misan, College of Basic Education, English Department, Iraq

- **Prof. Liqaa Habeb Al-Obaydi, PhD**
English Department, College of Education for Human Science, University of Diyala, Iraq
- **Dra. Clotilde Lechuga Jiménez, PhD**
Social Science Education, Education Science Faculty (Teatinos Campus), University of Malaga, Spain
- **Prof. Dr. Mehmet Şahin, PhD**
Mersin University, Faculty of Education, Department of Curriculum and Instruction, Turkey
- **Prof. Igor Kevorkovich Danilov, DSc**
Yuri Gagarin State Technical University of Saratov, Russia
- **Prof. Aleksander Valentinov Sladkowski, DSc**
Silesian University of Technology, Poland
- **Prof. Vera Karadjova, PhD**
“St. Kliment Ohridski” University – Bitola, Faculty of tourism and hospitality – Ohrid, Republic of North Macedonia
- **Prof. Aleksandar Trajkov, PhD**
“St. Kliment Ohridski” University - Bitola, Faculty of tourism and hospitality – Ohrid, Republic of North Macedonia
- **Prof. Petar Pepur, PhD**
University of Split, Croatia
- **Prof. Korhan Arun, PhD**
Namik Kemal University, Tekirdağ, Turkey
- **Prof. Yuliya Yorgova, PhD**
Burgas Free University, Bulgaria
- **Jelena Stankovic, PhD**
University of Nis, Serbia
- **Prof. Dr. Diana E. Woolfolk Ruiz**
CETYS University, Mexico
- **Prof. Gerhard Fiolka, PhD**
University of Fribourg, Switzerland
- **Prof. Haluk Kabaalioglu, PhD**
Yeditepe University, Turkey
- **Prof. Silva Alves, PhD,**
University of Lisbon, Portugal
- **Hanneke van Brugge, DHC mult**
Appeldoorn, The Netherlands
- **Prof. Elena Torina**
Tula State Pedagogical University "L. N. Tolstoy", Tula, Russia
- **Prof. Violeta Jotova**
Direction Pediatrics at St. Marina University Hospital - Varna, Bulgaria, Chair ESPE Postgraduate Qualification Committee
- **Prof. Tanya Timeva, MD, PhD**
Obstetrics and Gynecology Hospital "Dr. Shterev", Sofia, Bulgaria
- **Prof. Kiril Stoychev, PhD,**
Institute of Metal Science, Equipment and Technologies “Acad. A. Balevsci” with Haydroaerodinamics centre – BAS, Bulgaria
- **Assoc. Prof. Mark Shamtsyan, PhD**
Technical University, Saint Petersburg, Russia
- **Assoc. Prof. Oleksii Gubenia, PhD**
National University of Food Technologie, Kiev, Ukraine
- **Prof. Olexandr Zaichuk, DSc**
Ukrainian State University of Chemical Technology, Dnepropetrovsk, Ukraine
- **Prof. Eugene Stefanski, DSc**
Samara University, Russia

- **Assoc. Prof. Tatiana Strokovskaya, PhD**
International University of Nature “Dubna”, Dubna, Russia
- **Prof. DSc. Petar Sotirow**
Maria Curie-Sklodowska University of Lublin, Poland
- **Prof. Papken Ehasar Hovsepian**
Sheffield Hallam University, Sheffield, UK
- **Accos. Prof. Krassimir Dochev Dochev, PhD**
University of Portsmouth School of Engineering, UK
- **Mariana Yordanova Docheva, PhD**
University of Portsmouth School of Engineering, UK
- **Assoc. Prof. Ivan Antonov Lukanov, PhD**
University of Botswana, Faculty of Engineering and Technology, Gaborone, Botswana
- **Assoc. Prof. Petko Vladev Petkov, PhD**
Research Associate Cardiff University, UK
- **Prof. Stepan Terzian DSc**
Bulgarian Academy of Science, Bulgaria
- **Prof. Gabriel Negreanu, PhD**
University Politehnica of Bucharest, Romania

ORGANISING COMMITTEE

◆ **ORGANIZED BY: UNIVERSITY OF RUSE (UR) AND
UNION OF SCIENTISTS (US) - RUSE**

◆ **ORGANISING COMMITTEE:**

• **Chairperson:**

Acad. DTSc Hristo Beloev, DHC mult.
Rector of UR, Chairperson of US - Ruse

• **Scientific Secretary:**

Prof. Diana Antonova, DSc
dantonova@uni-ruse.bg, 082/888 249

• **THEMATIC FIELDS:**

- **Agricultural Machinery and Technologies, Agrarian Sciences and Veterinary Medicine**
- **Maintenance and Reliability**
- **Thermal, Hydro- and Pneumatic Equipment**
- **Ecology and Conservation**
- **Industrial Design**
Assoc. Prof. Plamen Manev, PhD
pmanev@uni-ruse.bg, +359 82 888 485
- **Pedagogy; Psychology and Methodology of training in...;** (27.10.23, Silistra)
Assoc. Prof. Evgenia Goranova, PhD,
egoranova@uni-ruse.bg
- **Philology** (27.10.23, Silistra)
Assoc. Prof. Rumiana Lebedova, PhD
rlebedova@uni-ruse.bg
- **Technical Sciences** (27.10.23, Silistra)
Assoc. Prof. Konstantin Koev, PhD,
kkoev@uni-ruse.bg
- **Chemical Technologies** (03-04.11., Razgrad)
- **Biotechnologies and Food Technologies** (03-04.11., Razgrad)
Prof. Tsvetan Dimitrov
conf_rz@abv.bg, +359 887 631 645
- **Mechanical Engineering and Machine-building Technologies**
Prof. Ivelin Ivanov, PhD
ivivanov@uni-ruse.bg, +359 82 888 472
- **Electrical Engineering, Electronics and Automation**
Assoc. Prof. Boris Evstatiev, DSc
bevstatiev@uni-ruse.bg, +359 82 888 371
- **Communication and Computer Systems**
Assoc. Prof. Galina Ivanova, PhD, giivanova@uni-ruse.bg, +359 82 888 855
Assoc. Prof. Adriana Borodzhieva, PhD, aborodzhieva@uni-ruse.bg, +359 82 888 734
- **Transport and Machine Science**
Assoc. Prof. Simeon Iliev, PhD
spi@uni-ruse.bg, +359 82 888 331

- **Sustainable and Intelligent Transport Systems, Technologies and Logistics**
Prof. Velizara Pencheva, PhD
vpencheva@uni-ruse.bg, +359 82 888 558, +359 82 888 608
- **Economics and Management**
Pr. Assist. Prof. Miroslava Boneva, PhD, mboneva@uni-ruse.bg, +359 82 888 776
Pr. Assist. Prof. Elizar Stanev, PhD, eastanev@uni-ruse.bg, +359 82 888 557
- **European studies and International Security**
Prof. Vladimir Chukov, DSc,
vchukov@uni-ruse.bg, 0889 768745
- **Mathematics, Informatics and Physics**
Prof. Tsvetomir Vasilev, PhD
tvasilev@uni-ruse.bg, +359 82 888 475
- **Education - Research and Innovations**
Assoc. Prof. Emilia Velikova, PhD, evelikova@uni-ruse.bg, 0885 635 874
Pr. Assist. Prof. Ralica Vasileva-Ivanova, PhD, rivanova@uni-ruse.bg, 0884 109 719
- **Pedagogy and Psychology**
Assoc. Prof. Valentina Vasileva, PhD, rk-ppi@uni-ruse.bg, 0898 407 577
Assoc. Prof. Galina Georgieva, PhD, zrk-ppi@uni-ruse.bg, 0889 951 920
- **History, Ethnology and Folklore**
Assist. Prof. Veselka Radeva, PhD
vradeva@uni-ruse.bg, 082888437
- **Linguistics, Literature and Art Science**
Assoc. Prof. Velislava Doneva, PhD,
doneva_v@uni-ruse.bg, 0886 060 299
- **Health Promotion**
Assoc. Prof. Stefka Mindova, PhD
smindova@uni-ruse.bg, +359 882 895 149
- **Social Work**
Pr. Assist. Prof. Ana Popova, PhD
apopova@uni-ruse.bg, +359 889 874 219
- **Medical and Clinical Diagnostic Activities**
Pr. Assist. Deniza Trancheva, MD, PhD
dtrancheva@uni-ruse.bg, +359 82 888 410
- **Health care**
Assoc. Prof. Tsveta Hristova, PhD
tshristova@uni-ruse.bg, +359 878 389 793
- **Law**
Assoc. Prof. Elitsa Kumanova, PhD
ekumanova@uni-ruse.bg, +359 884 980 050
- **National Security**
Assoc. Prof. Milen Ivanov, DSc
poligon@abv.bg, +359 82 888 736
- **Quality of Higher Education**
Prof. Ivanichka Serbezova, PhD, iserbezova@uni-ruse.bg
Daniela Todorova, dtodorova@uni-ruse.bg, +359 82 888 378

- **REVIEWERS**

- Prof. Ivan Zamfirov, PhD
- Assoc. Prof. Danail Gospodinov, PhD
- Assoc. Prof. Danko Tonev, PhD
- Assoc. Prof. Georgi Nenov, PhD
- Assoc. Prof. Rosen Radev, PhD
- Pr. Assist. Prof. Mariyana Ilieva, PhD
- Pr. Assist. Prof. Nikolay Ferdinandov
- Pr. Assist. Prof. Nikolay Stankov, PhD

MECHANICAL ENGINEERING AND MACHINE-BUILDING TECHNOLOGIES

Content

1. FRI-1.317-1-MEMBT-01	11
Technological Characteristics of Covered Electrodes from the Nomenclature of „Electrodes Factory” Ltd – Ihtiman	
<i>Nikolay Ferdinandov</i>	
2. FRI-1.317-1-MEMBT-02	17
Investigation of the Influence of Chemical Composition on Hardenability Bands for Quenching and Tempering Steels	
<i>Iliyan Danev, Rossen Radev, Danail Gospodinov</i>	
3. FRI-1.317-1-MEMBT-03	25
Investigation of the Possibility of Modifying a Thermal Probe in Nickel-Alloy Probe Test Method	
<i>Danail Gospodinov</i>	
4. FRI-1.317-1-MEMBT-04	33
Method for Measuring the Relief Angles of Twist Drills Using Cad Systems	
<i>Aleksandar Ivanov, Anton Grozev</i>	
5. FRI-1.317-1-MEMBT-05	41
Overview of the Railway Sector in Bulgaria	
<i>Svilen Gardev</i>	
6. FRI-1.317-1-MEMBT-06	49
Automated Palletizing of Packaged Products	
<i>Ivanka Peeva, Chavdar Kostadinov</i>	
7. FRI-1.317-1-MEMBT-07	55
Investigation of The Influence of Structural Parameters on the Natural Frequencies of a Thin-Walled Beam	
<i>Dimitar Dimitrov, Pavel Petrov</i>	
8. FRI-1.317-1-MEMBT-08	60
Analysis and Classification of Approaches from Practice to Limit the Occurrence of Vibrations in the Mechanical Processing of Machine Parts by Cutting	
<i>Dimitar Dimitrov, Nikolay Stankov</i>	
9. FRI-1.317-1-MEMBT-09	70
Study the Influence of the Grain Size on the Surface Morfology in Laser Engraving	
<i>Veselin Hristov, Roussi Minev, Emil Yankov, Mariana Ilieva</i>	
10. FRI-1.317-1-MEMBT-10	78
Influence of Severe Plastic Deformation on the Corrosion Behaviour of Aluminum Alloys - a Review	
<i>Mariana Ilieva</i>	