

Volume 63 of PROCEEDINGS includes the papers presented at the scientific conference RU&SU'24, organized and conducted by University of Ruse "Angel Kanchev" and the Union of Scientists - Ruse. Series 6.1 contains papers reported in the Mathematics, Informatics and Physics section.

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-EEEE	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-EEEE	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-1.407-1-MIP	Mathematics, Informatics and Physics
6.2.	FRI-1.313-1-PP	Pedagogy and Psychology
	SAT-1.313-1-PP	
6.3.	FRI-2G.307-1-LL	Linguistics and Literature
	FRI-2G.408-1-AS	Art Studies

6.4.	FRI-2G.405-1-ERI	Education - Research and Innovations
	SAT-2G.405-1-ERI	
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-239-1-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
- **Assoc. Prof. Alexandrache Carmen, PhD**
Department of Teacher Training, “Dunarea de Jos”, Galati University, Romania
- **Prof. Alberto Cabada**
University of Santiago de Compostela, Faculty of Mathematics, Santiago de Compostela, Spain
- **Kamen Rikev, Dr Hab.**
Institute of Slavic Philology, Maria Curie-Skłodowska University in Lublin, Poland
- **Anna Klimentova, PhD**
Constantine the Philosopher University of Nitra, Slovakia

- **Prof. Ricardo Gobato, PhD**
Secretariat of State of Parana Education and Sport, Laboratory of Biophysics and Molecular Modeling Genesis, Brasil
- **Prof. Fatima Rahim Abdul Hussein, PhD**
University of Misan, College of Basic Education, English Department, Iraq
- **Prof. Liqaa Habeb Al-esedi, PhD**
English Department, College of Education for Human Science, University of Diyala, Iraq
- **Prof. Esengeldin Baurzhan Satybaldyuly, PhD**
Pavlodar Pedagogical University “Alkey Margulan”, Kazakhstan
- **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
- **Jovica 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 Bruggen, 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 Hydroaerodynamics 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
- **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
- **Prof. Dobrin Vasilev, MD, PhD**
UMHAT Medica Cor, Ruse, Bulgaria
- **Prof. Nicolae Craciunoiu**
University of Craiova
- **Assoc. Prof. Stelian Tarulescu**
Transilvania University of Brasov
- **Assoc. Prof. PhD Andrei-Alexandru Boroiu**
University of Pitești
- **Prof. Renzo Capitani, PhD**
University of Florence, Engineering School, Italia
- **Prof. Radoslaw Wrobel, DSc**
Wrocław University of Science and Technology, Poland
- **Assoc. Prof. Darina Dimitrova PhD**
University of Economics - Varna

ORGANISING COMMITTEE

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

◆ **ORGANISING COMMITTEE:**

● **Chairperson:**

Prof. Gencho Popov, PhD – Rector of UR, Chairperson of US – Ruse,
Prof. DTSc. Hristo Beloev, DHC mult., Academician of Bulgarian Academy of Sciences

● **Scientific Secretary:**

Assoc. Prof. Desislava Atanasova, PhD
datanasova@uni-ruse.bg; 082/888 249

● **THEMATIC FIELDS:**

● **Agricultural Machinery and Technologies, Agrarian Sciences and Veterinary Medicine**

Assoc. Prof. Atanas Atanasov, PhD,
aatanasov@uni-ruse.bg, +359 885 497 406

● **Maintenance and Reliability**

Prof. Mitko Nikolov, DSc,
mnikolov@uni-ruse.bg, +359 82 888 458

● **Thermal, Hydro- and Pneumatic Equipment**

Prof. Gencho Popov, DSc,
gspopov@uni-ruse.bg, +359 82 888 441

● **Ecology and Conservation**

Assoc. Prof. Plamen Manev, PhD,
pmanev@uni-ruse.bg, +359 889 382 797

● **Industrial Design**

Assoc. Prof. Yordan Doychinov, PhD,
doichinov@uni-ruse.bg, +359 887 273 040

● **Pedagogy; Psychology and Methodology of training in...; (18.10.24, Silistra)**

Assoc. Prof. Diana Zhelezova-Mindizova, PhD,
dmindizova@uni-ruse.bg

● **Philology (18.10.24, Silistra)**

Assoc. Prof. Rumiana Lebedova, PhD,
rlebedova@uni-ruse.bg

● **Technical Sciences (18.10.24, Silistra)**

Assoc. Prof. Evgenia Goranova, PhD,
egoranova@uni-ruse.bg

● **Chemical Technologies (08-09.11.24, Razgrad)**

● **Biotechnologies and Food Technologies (08-09.11.24, Razgrad),**

Prof. Tsvetan Dimitrov, PhD,
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,
Assoc. Prof. Kiril Sirakov, csirakov@uni-ruse.bg, +359 82 888 364
- **Communication and Computer Systems**
Assoc. Prof. Yordan Kalmukov, jkalmukov@uni-ruse.bg, +359 82 888 681,
Assoc. Prof. Adriana Borodzhieva, PhD, aborodzhieva@uni-ruse.bg, +359 82 888 734
- **Transport and Machine Science**
Assoc. Prof. Tonch Balbuzanov,
tbalbuzanov@uni-ruse.bg, +359 82 888 608
- **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
Pr. Assist. Elizar Stanev, eastanev@uni-ruse.bg, +359 82 888 557
- **Mathematics, Informatics and Physics**
Prof. Tsvetomir Vasilev, PhD,
tvasilev@uni-ruse.bg, +359 82 888 475
- **Education - Research and Innovations**
Pr. Assist. Prof. Ralica Vasileva-Ivanova, PhD,
rivanova@uni-ruse.bg, 0884 109 719
- **Pedagogy and Psychology**
Assoc. Prof. Valentina Vasileva, PhD, vvasileva@uni-ruse.bg, 0898 407 577,
Assoc. Prof. Galina Georgieva, PhD, gggeorgieva@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
Pr. Assist. Prof. Petya Stefanova, PhD, pstefanova@uni-ruse.bg, 0896820470
- **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**
Pr. Assist. Prof. Yoana Lukanova, PhD
ylukanova@uni-ruse.bg, +359 885 047 644
- **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. Tzvetomir Vassilev, PhD
 - Prof. Valentina Voinohovska, DsC

MATHEMATICS, INFORMATICS AND PHYSICS

Content

1. FRI-1.407-MIP-01 PROJECT-BASED LEARNING AND ITS IMPACT ON CREATIVITY AND PROBLEM-SOLVING SKILLS IN PROFILING COMPUTER SCIENCE EDUCATION <i>Stanaila Karagaeva, Svetlozar Tsankov</i>	12
2. FRI-1.407-MIP-02 IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE IN E-COMMERCE STORES <i>Serkan Sadulov, Kamelia Shoilekova</i>	20
3. FRI-1.407-MIP-03 THE ROLE OF SCRIPTING IN THE GAME ENGINE <i>Mustafa Mustafov, Kamelia Shoilekova</i>	26
4. FRI-1.407-MIP-04 3D TERRAIN GENERATION SUBSYSTEM <i>Valentin Velikov, Salih Redjeb</i>	27
5. FRI-1.407-MIP-05 CYBERSECURITY FIRST PRINCIPLES – STRATEGY AND TACTICS <i>Valentin Velikov</i>	34