TECHNICAL UNIVERSITY OF CLUJ-NAPOCA

ACTA TECHNICA NAPOCENSIS

Series: Applied Mathematics, Mechanics, and Engineering
Vol. 64, Issue Special I, January, 2021

INTRODUCING THE ERGONOMICS AND HUMAN FACTORS REGIONAL EDUCATIONAL CEEPUS NETWORK

Gyula SZABÓ, Zoltán BALOGH, Tihomir DOVRAMADJIEV, Anca DRAGHICI, Brigita GAJŠEK, Tanja JURČEVIĆ LULIĆ, Michael REINER, Beata MRUGALSKA, Aleksandar ZUNJIC

Abstract: *The Ergonomics and Human Factors Regional Educational CEEPUS Network was established and approved for funding as a result of collaboration between nine universities with a key role in teaching and cultivating ergonomic knowledge and the profession of ergonomist (especially in industrial and logistics systems fields). The prestigious participating universities in Belgrade, Budapest, Krems, Maribor, Nitra, Poznan, Timisoara, Varna and Zagreb aim to promote cooperation in research (providing support for doctoral programs, joint scientific and didactic publications) and in education, at the level of European requirements and standards, but with a focus especially in the Danube region. The aim of the network is to facilitate, encourage and support education, research and professions in the field of ergonomics and the human factor, mainly through mobility, guidance and joint support of doctoral programs (in accordance with existing legislation, rules and regulations in each partner university), and in the long term it is aimed at creating a common doctoral training in the field.*

Key words: *Central European Exchange Program for University Studies (CEEPUS), network, ergonomics, human factors, collaborative work, mobility, education.*

1. INTRODUCTION TO THE CENTRAL EUROPEAN EXCHANGE PROGRAM FOR UNIVERSITY STUDIES MOBILITY

The Central European Exchange Program for University Studies (CEEPUS) is a multilateral University exchange program in the EU Danube Region. It started with the agreement signed by Austria, Bulgaria, Hungary, Poland, the Slovak Republic and Slovenia in 1995, later Albania, Bosnia-Herzegovina, Croatia, Czech Republic, Moldova, Montenegro, North Macedonia, Romania, Serbia and Kosovo joined the program. In the 2019/20 Academic year there are 106 CEEPUS networks.

The new European Union Strategy for Danube Region [1] has defined 85 actions in 12 Priority Areas, of which CEEPUS contributes the most to the following action points:

- Strengthen cooperation among universities, research organizations and SMEs in the Danube Region
- increase awareness and visibility of science and innovation in the Danube
- Quality and Efficiency of Education and Training Systems
- Relevant and High-Quality Knowledge, Skills and Competences.

While the structure provides possibilities to mobility, the objectives and focus areas of individual networks covers most of the remaining pillars and action points of the Danube Region Strategy.

Additionally, to the general objective to promote cooperation in the framework of the EU Strategy for the Danube Region (EUSDR), the CEEPUS III focus on joint PhD programs. Network activities on one hand range from semester long or short-term teacher and student mobility on Bachelor, Master and PhD level, short term excursions, intensive courses, and on the other hand consist of joint research, event organization and educational program development.

2. LEARNING ERGONOMICS

The network will undoubtedly provide an excellent opportunity for teacher and student mobility to acquire ergonomic knowledge in the region. In addition, the tangible objective is to develop and implement the joint postgraduate or PhD program titled "Ergonomics and Human Factors specialization".

The partners decided to follow a thoughtful, detailed approach, with several milestones and valuable achievements and continual development of cooperation:

- 1st year strengthen the network, establishing links among partners;
- 2nd year Need and legislation analysis;
- 3rd year Drafting curricula and joint development a course;
- 4th year Drafting a mutual inter-university agreement;
- 5th year Mutual inter-university agreement and development of courses;
- 6th year Establishment of the program in the designated country by the university selected;
- 7th starting the joint program, recruiting students;
- 11th year first graduations.

In the first academic year, the main goals are:

- Define the reflection of ergonomics in doctoral schools at participating institutions, clarifying the feasibility of the joint program and the obstacles;
- Frame the conceptual definition of the formal and substantive requirements for the joint program with the participation of the Centre for Registration of European Ergonomists (CREE);
- Involve other participating units to join the network.

The biggest challenge for this network is to find the legal position of the proposed joint educational program in the educational administrative structure. On the one hand, one can interpret it as an ergonomics and human factors degree with several specializations. However, on the other hand, it can be interpreted as ergonomics and human factors specialization in various areas, e.g. mechanical, software or safety engineering.

Ergonomics, as an occupation, appears twice in the classification of European Skills, Competences, Qualifications and Occupations, see Table 1 [2]. This duality reflects the fact that the practice of the ergonomic profession requires the knowledge of the target area with the same weight as the knowledge of the ergonomic principles, methods and data.

The left-hand column of the table contains the narrowest interpretation of ergonomics, i.e. workstation design and prevention of musculoskeletal disorders, as part of occupational health safety. This occupation relates to human safety, therefore as such a degree in this area implies strict regulatory requirements.

The right. column represents the application-oriented ergonomics, when ergonomics appears as part of an engineering occupation: This case there are no specific requirements, however the ergonomics content is profession dependent and varies among qualifications in content and quantity.

When creating an ergonomic master's or bachelor's degree another difficulty is that the training requirement is not currently formulated in the competency system.

Table 1

Ergonomics Occupations in the classification of European Skills, Competences, Qualifications and Occupations [2]

Hierarchy 2 Professionals 22 Health professionals 226 Other health professionals 2263 Environmental and occupational health and hygiene professionals health and safety officer **ergonomist**	Hierarchy 2 Professionals 21 Science and engineering professionals 214 Engineering professionals 2141 Industrial and production engineers industrial engineer

The legal requirements of the establishment of a university program are quite different according to these approaches which can be different in different countries.

Thanks to the internationally adopted minimum requirements of professional ergonomists, the content of the program is quite explicit, and it should contain 50% general ergonomics and human factors and 50% application-oriented knowledge [3]. Areas of Knowledge:

- Principles of Ergonomics;
- Populations and General Human Characteristics;
- Design of technical systems;
- Research, evaluation and investigative techniques;
- Professional issues;
- Ergonomics: Activity and/ or Work Analysis;
- Ergonomic Interventions;
- Ergonomics: physiological and physical aspects;
- Ergonomics: psychological and cognitive aspects;
- Ergonomics: social and organizational aspects;
- Project work.

To meet the educational requirement 60 European Credit Transfer System credit points (ECTS) from the knowledge areas above. Additionally, the registration as a European Ergonomist requires one year supervised and two years independent work practice and professional development plan.

3. FUNDING PARTNERS

The participating institutions in the system have different educational profiles; however, they share the fact that ergonomics is a priority in their education program, and they perform high-quality ergonomic research and education programs, and they employ prominent ergonomists.

The coordinators of the "Ergonomics and Human Factors Regional Educational CEEPUS Network" work together in various international ergonomics organizations, e.g. International Ergonomics Association (www.iea.cc) and the Federation of European Ergonomics Societies (http://ergonomics-fees.eu/) and already have a virtual platform and modus operandi for collaboration. Most importantly, they represent national assessment boards at the meeting of the Centre of Registration of European Ergonomist (www.eurerg.eu), which operates the professional certification system of ergonomists according to the globally agreed educational, training and continues professional development criteria.

The composition of the network provides the institutional diversity needed to develop a program in this multi-disciplinary scientific domain. It is also common in the participating institutions that they are devoted to starting an ergonomics/human factors training based on the standard criteria of ergonomics, and they consider the Danube Region cooperation as a critical success factor.

3.1. Óbuda University Donát Bánki Faculty of Mechanical and Safety Engineering, Hungary

In the field of safety science, this faculty is actively involved in domestic professional life, play a vital role in the adaptation of international knowledge and practice, and actively participate in worldwide professional cooperation. Primary safety and security research topics in the faculty:

- IT safety and security;
- Organizational culture and behavioral safety;
- Human reliability [4];
- Security technology;
- Biometric identification;
- Critical infrastructure protection;
- Occupational safety and health [5];
- Ergonomic Risk Assessment [6];
- Fire protection and industrial safety.

Donát Bánki Faculty of Mechanical and Safety Engineering offers a postgraduate course on fire protection engineering, rehabilitation engineering and health and safety.

The doctoral school on Safety Science has over 100 students from different countries

thanks to various grants, e.g. Stipendium Hungaricum.

3.2. IMC University of Applied Sciences Krems, Austria

IMC University of Applied Sciences Krems has several Departments available for cooperation including Bachelor and Master degrees. Main departments include degrees like "business administration", "export-oriented management" "tourism and leisure management" "informatics" "medical and pharmaceutical biotechnology" and "applied chemistry" to name only the English run Bachelor degree programs.

There are several research fields of this partner competencies which would be active within the Ergonomics and Human Factors Regional Educational CEEPUS Network, for example:

- New World of Work (NWoW) began development under the California Community Colleges system, which is the largest higher education system in the nation with 72 districts and 115 colleges serving over 2.1 million students each year, https://newworldofwork.org/;
- Scan2VR projects' outcomes as described at https://www.fh-krems.ac.at/en/research/projects/scan2vr/;
- The facilities offer by the eVRyLab has created a highlight in virtual-reality movement technology, underlining its position as a digitalization trailblazer in Lower Austria as presented online at: https://www.youtube.com/playlist?list=PLSXz1Aqa8l5U4he0g5THScDaMHRrb3RMB;
- Other created and existing facilities for research as presented at: https://www.fh-krems.ac.at/en/research/projects/. Main research areas of interest are consumer studies and innovation management; digital transformation and organizational development; tourism marketing and technology and innovative teaching methodology for business.

3.3. Technical University of Varna, Faculty of Shipbuilding, Bulgaria

The Technical University of Varna (TU-Varna), Bulgaria is the second largest technical university in Bulgaria. TU-Varna is a state university and is divided into four academic Faculties – with 22 departments, 2 colleges and Department of Mathematics and Foreign Languages; Faculty of Shipbuilding; Faculty of Computer Sciences and Automation, Faculty of Electrical Engineering, Faculty of Manufacturing Engineering and Technologies [7]).

In the last 53 years more than 50 000 students graduated in 23 specialties. The university diplomas are with European acceptance in 24 Bachelor and 48 Master degree programs and PhD studies.

The strategy of TU-Varna in scientific research aims to establish the institution as an innovation and technology center. The following activities are realized:

- Stable connections with leading companies;
- Creation of specialized laboratories;
- Organization of business-incubators and High-Tech centers;
- Creation of virtual labs at the university. TU-Varna has student hostels for 1500 students, University library, Sport center.

TU-Varna is a leading research center in Advanced technologies in design, Software technologies, Internet and web-applications, Smart technologies in telecommunications and computer networks. There are several centers in TU-Varna as the Advanced Technologies in Design Center, CAD-CAM Lab, Applied Technologies in Health Center, Samsung Innovation Lab, Naval Architecture and Marine Technology Center, Mikrotik Lab. TU-Varna collaborates closely with Municipality of Varna in projects dedicated to 'science in the society' and citizenship.

One of the main faculties in Technical University of Varna is the Faculty of Shipbuilding. It has a substantial place in the structure of the University for development of staff and specialists in several established specialties of local and international importance and recognition. The application of modern

disciplines has an important strategic basis, consistent with the local and regional evolvement of the area. The development of the sustainable and advanced technologies in design, ergonomics aspects, environmental protection and health care are of key importance in the concept of the TU-Varna development in modern global dynamic society [8]. TU-Varna is a Member of: EUA and BSN Black sea network, Certificated in ISO 9001.

There are several research fields of this partner competencies which would be active within the Ergonomics and Human Factors Regional Educational CEEPUS Network, for example: ergonomics in the field of ship design and manufacturing; exploring the use of the existing infrastructure for research and development for doctoral programs in collaboration with CEEPUS partners.

3.4. University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture, Croatia

The University of Zagreb (established 1669) is the oldest and biggest university in the Republic of Croatia. With 30 Faculties and 3 Art Academies it is the flagship educational institution in the country, a place where more than 7,900 teachers and 72,000 students develop knowledge and acquire skills. The Faculty of Mechanical Engineering and Naval Architecture is the oldest and the largest mechanical engineering school in the Republic of Croatia. Since the first lectures were held at the Royal Technical College in 1919, the Faculty has been providing state-of-the-art education in its mechanical engineering and naval architecture degree courses and since 1995 in the aeronautical engineering degree course too.

The Faculty of Mechanical Engineering and Naval Architecture offers undergraduate, graduate and postgraduate programmes in three courses of study: mechanical engineering, naval architecture and aeronautical engineering. Specializations and sub-specializations in the mechanical engineering course are:

- Design (Medical Design, Product Design and Development, Mechanisms and Robots, IC Engines and Motor Vehicles);
- Process and Energy Engineering (Thermal Engineering, Process Engineering and Energy Engineering);
- Production Engineering (Production Automation, Machining Systems, Quality Assurance, Manufacture and Assembly, Welded Structures);
- Mechatronics and Robotics; Industrial Engineering and Management; Marine Engineering; Engineering Modelling and Computer Simulation;
- Computer Engineering (Intelligent Assembly Systems, Polymer Product Manufacture, Computer Modelling of Tools and Dies, Computer-Based System Management, Computer-Integrated Product Development, Modern Machining Systems and Processes, Quality Management, Foundry);
- Materials Engineering.

In the Republic of Croatia, at this moment, there is no system of formal education in the field of “ergonomics” or “human factors” within the undergraduate, graduate and doctoral studies at higher education institutions. However, there are many courses in the field of “ergonomics” or “human factors” that are taught at undergraduate, graduate and doctoral curricula at the higher education institutions in the Republic of Croatia.

Research topics in the field of Ergonomics and Human Factors at the Faculty of Mechanical Engineering and Naval Architecture:

- Biomechanics in ergonomics (determination and analyses of load on the human) [9];
- Development of assessment procedures [10];
- Ergonomics in product and engineering design [11; 12];
- Improvement of human – machine - environment design [13];
- Ergonomics in logistics (ergonomics in order-picking process).

There are several research fields of this partner competencies which would be active within the Ergonomics and Human Factors Regional Educational CEEPUS Network, for example: biomechanics in ergonomics, ergonomics design and assessment in the field of ship design and manufacturing; exploring the

use of the existing infrastructure for research and development for doctoral programs in collaboration with CEEPUS partners. Furthermore, University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture, Croatia and Technical University of Varna, Faculty of Shipbuilding, Bulgaria are complementary partners that will exchange their experiences in the ergonomics applications in the shipbuilding industry.

3.5. Poznan University of Technology, Faculty of Engineering Management, Poland

Poznan University of Technology offers education at 10 faculties which provide students with a choice of 30 fields of study. It has 16,000 students of I and II cycles, Phd students and participants of post-graduate programmes. Here work more than 1,300 academic staff. Implementation of PUT's mission enables the vision to become reality - to be one of the best technical universities in Poland in terms of education quality and high level of scientific research.

The Poznan University of Technology:

- Offers lectures in English;
- Cooperates with more than 100 universities all over the world;
- Offers double diplomas;
- Is a member of CESAER (Conference of European Schools for Advanced Engineering Education and Research) – a European organization that brings together the best technical schools, a member of SEFI (Societe Europeenne pour la Formation des Ingenieurs), EUA (European University Association), ADUEM (Alliance of Universities for Democracy) and IAU (International Association of Universities).

The Faculty of Engineering Management offers Bachelor and Master courses in:

- Engineering Management;
- Logistics;
- Safety Engineering.

The second-degree students of Safety Engineering could deepen their knowledge, competences and skills specializing in:

- Product safety and working conditions (specialization: Ergonomics and Occupational Safety);
- Occupational health and safety management (specialization: Integrated Safety Management Organization);
- System approach to safety at various organizational levels of business and administrative entities (specialization: Safety and Crisis Management).

The alumni of the specialization "Ergonomics and Occupational Safety" get interdisciplinary education which can be applied to support services in the system of labor protection in the field of ergonomics as well as to manage employees' health and safety. They acquire knowledge in the field of: Ergonomics in technology, Simulation and digital human modeling, Product ergonomics and industrial design, Heuristic methods in ergonomic design, Measurement methods in work safety, Diagnosis of work environment, Diagnosis of human environment, Human factor in safety, Economics in safety, Communication in safety and Diagnosing of performing work.

3.6. Politehnica University of Timisoara (UPT), Faculty of Management in Production and Transportation, Romania

UPT is the biggest technical universities from the West part of Romania, established in 1920 through a royal decree. During its 100 years of existence, mor then 118,000 engineers have graduated UPT.

In the present, over 13,000 students are registered on various education levels (Bachelor, Master, Doctoral and Postdoctoral, according to the Bologna paradigm). UPT has 10 faculties, within the 25 departments of the university work nearly 700 teachers and the auxiliary and administrative personnel amount to 500 staff.

The research and education in the field of Ergonomics and Human Factors are supported by three faculties:

1. Faculty of Management in Production and Transportation (industrial ergonomics field, workplace management and occupational health and safety - Bachelor, Master and

PhD. programmes in the field of Engineering and Management);
2. Faculty of Architecture and City Planning (ergo-design filed for different types of spaces - Bachelor level);
3. Faculty of Mechanical Engineering (industrial ergonomics field, robotics - Bachelor, Master and PhD. programmes in the field of Mechanical Engineering and Industrial Engineering).

Research topics in the field of Ergonomics and Human Factors, with consistent results recognized by the literature in this field, are:

- Biomechanics in ergonomics (movement analysis and body strength analysis) [14; 15];
- Development of assessment procedures of occupational risks, including ergonomics risk mainly in production systems [16; 17];
- Ergonomics in logistics systems (research for ergonomics optimization of the warehouses) [18; 19];
- Safety culture and occupational health and safety aspects [20; 21].

3.7. University of Belgrade, Faculty of Mechanical Engineering

In its 200-year tradition, the University of Belgrade has educated more than 300,000 people. There are 31 faculties in the structure of this university. At the University of Belgrade, Faculty of Mechanical Engineering (UB-FME) European exchanges take place under the established Tempus and Socrates Programmes of the European Commission.

As Faculty fully implements the European Credit Transfer System (ECTS), qualifications gained at Faculty of Mechanical Engineering are easily recognized and understood in other European countries, and vice versa. There are three levels of studies: Bachelor Studies (ECTS-180), Master Studies (ECTS-120) and Doctoral (Ph.D.) Studies (ECTS-180) [22].

Courses of ergonomics at the UB-FME are:

- Industrial ergonomics (Bachelor level);
- Ergonomic designing (Master level);
- Man - machine system design (Master level);
- Man - machine interface (PhD level).

Basic research areas in ergonomics at the UB-FME:

- Human - computer interaction;
- Ergonomics in logistics;
- Safety management;
- Human information processing;
- Furniture ergonomics;
- Anthropometry;
- Ergonomics of vehicles;
- Ergonomics of products.

Considering the research and education fields of this partner which will be active within the Ergonomics and Human Factors Regional Educational CEEPUS Network, several research topics have been developed in collaborative work within the Network, as the following: design for ergonomics and ergonomics design and exploiting the existing infrastructure for research and development with master and PhD students.

3.8. University of Maribor, Faculty of Logistics, Slovenia

Faculty of logistics encourages students to study the ergonomic aspect in logistics at all university level from bachelor to PhD studies. Co-mentoring from countries that systematically develop ergonomic skills would be beneficial.

Slovenia is one of the few non-FEES (the Federation of European Ergonomics Societies) and non-IAE (International Ergonomics Association) countries with no trained ergonomists.

Participation in the Ergonomics and Human Factors Regional Educational CEEPUS Network is of great importance to country and Faculty of logistics in developing an educational program, transferring good practices from more advanced countries, so that through logistics graduates we can influence the reduction of musculoskeletal disorders in the logistics sector. Research activities:

- Overview of Ergonomics and teachers' competences in Slovenian education programs;
- The impact of the applied technology on health and productivity in manual working systems [23; 24];

- Towards balanced productivity and ergonomics in the pursuit of lean warehousing and production [25];
- Use of smart glasses in logistics [26] considering ergonomics [27; 28];
- Workplace design in the Industry 4.0 Era from productivity and ergonomics perspective [29].

Considering the research and education fields of this partner which will be active within the CEEPUS Network, several research topics have been considered to be developed in collaborative work within the Network, as the following: workplace design based on ergonomics principles and in the context of Industry 4.0, and exploiting the existing infrastructure (e.g., smart glasses for movement studies) for research and development with master and PhD students.

3.9. Constantine The Philosopher University in Nitra, Faculty of Natural Sciences, Slovakia

The Faculty of Natural Sciences was founded in 1993 when it started its activities as an independent, research and education faculty of a university type. These activities were rooted in more than 40 years of teacher training tradition in Nitra, including the teachers for national schools. The main task of the Faculty is to provide higher education and conduct creative scientific research in natural sciences, mathematics and informatics.

The Faculty's mission is to prepare highly qualified professionals in a wide range of accredited scientific and professional study programs on the Bachelor's, Master's and Doctoral level.

The Faculty has a long tradition in teacher training in science, mathematics and informatics. In cooperation with other Faculties at Constantine the Philosopher University in Nitra, it provides the broadest range of higher education teacher training programs in Slovakia in natural sciences, mathematics and informatics in combination with subjects in the field of linguistics, art, technology, humanities and social sciences.

Higher education at the Faculty is closely tied to research, development and other creative activities of its employees and doctoral students.

The faculty is organized into eight departments (Department of Botany and Genetics; Department of Zoology and Anthropology; Department of Chemistry; Department of Ecology and Environmental Studies; Department of Physics; Department of Geography and Regional Development; Department of Informatics and Department of Mathematics) and Institute of Management and Information Technologies.

The research at the Department of informatics is divided into three directions:

- Knowledge Discovery and Data Analysis Research Group;
- Modelling and Simulation in Specific Environments Research Group;
- Theory of Computer Science Education Research Group.

Constantine The Philosopher University in Nitra, Faculty of Natural Sciences, Slovakia partner will assure the methodological support for the common research and education modules within the CEEPUS Network, as they proof a lot of experiences in these fields [30; 31; 32].

4. PLANNED ACTIVITIES

The participating units have all the usual shared activities like a regular CEEPUS network, e.g. Erasmus+ student (PhD) and teacher mobility, professional workshops, summer universities, research and educational projects, and successful international doctorands workshops. The educational objective for the next academic year of the “Ergonomics and Human Factors Regional Educational CEEPUS Network” is to organize two virtual seminars, have a workshop, and complete at least one teacher and student mobility to and from each participating unit. Our professional objective is to explore the legal requirements of a joint safety-related doctoral program and seek a solution to shared mentoring possibilities.

The plan for the academic year 2021/2022 is to make several teachers visit to provide the opportunity to:

- Guest lecturing for Master and PhD levels of education;
- Guest consultation of Bachelor and Master thesis;
- Co-supervise of Master and Bachelor thesis;
- Pilot a twin thesis system (same or similar topics at several partners);
- Project work for student-teams coming from different partners;
- Short term student mobility;
- Student mobility for a semester.

The first PhD workshop scheduled during the 8th International Conference Ergonomics 2020, which will be in December 2020 in Zagreb, while the second is planned in Timisoara, during April 2021, when Timisoara will be European Capital Cultural in 2021.

The Virtual Doctoral Workshop will be the primary arena for continuous networking among students and faculty members of our network partners and beyond.

Regarding the dissemination actions:

- All members of the network will send and receive faculty members and students;
- Information on the network on our websites in each participating language;
- Publication on our activities and our goals.

The operational actions planned for the CEEPUS network are a coordinator meeting if we can raise additional resources and regular virtual coordinator meeting.

5. CONCLUSION

The Ergonomics and Human Factors Regional Educational CEEPUS Network mission is to contribute to the competitiveness of the Danube Region by providing e competency on the human-oriented product, process, and organizational innovation.

The goal of the Ergonomics and Human Factors Regional Educational CEEPUS Network is to strengthen the ongoing collaboration of the participating institutions, to create a formal academic structure for student exchange on bachelor, master, and doctoral level, to participate in each other's master and doctoral programs, and to develop shared training contents, university courses, and joint doctoral programs in the long term. In addition, the common research and publications will better valorize the existing infrastructure and knowledge of all partners creating valuable added value to the ergonomics and human factors field of science.

6. REFERENCES

[1] European Union, *Commission Staff Working Document Action Plan replacing Staff Working Document SEC(2010) 1489 final accompanying the Communication From the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions European Union Strategy for Danube Region*. Retrieved from: https://danube-region.eu/wp-content/uploads/2020/04/EUSDR-ACTION-PLAN-SWD202059-final.pdf (Access on 12 April 2020)

[2] European Commission, *Qualification Portal*. Retrieved from: https://ec.europa.eu/esco/portal/qualification (Access on 8 March, 2020)

[3] CREE, Centre of Registration of European Ergonomist, *Requirements for Registration of European Ergonomists* (Eur.Ergs). Retrieved from: https://eurerg.eu/wp-content/uploads/2018/10/Minimum-Requirements-V2017_2.pdf (Access on 12 April, 2020)

[4] Koncz A., Pokorádi L. & Szabó G., *Failure Mode and Effect Analysis and Its Extension Possibilities*, Repüléstudományi Közlemények (1997-TŐL) 30:1, 247-253, 2018.

[5] Szabó, G. & Németh, E., *Development an Office Ergonomic Risk Checklist: Composite Office Ergonomic Risk Assessment* (CERA Office). In: Fujita, Y., Alexander, T., Albolino, S., Tartaglia, R. & Bagnara, S. (Eds), Proceedings of the 20th Congress of the International Ergonomics Association (IEA 2018), Springer International Publishing, (2019), chapter 64, 590-597.

[6] Szabó G., *Usability of machinery*, Advances in Intelligent Systems and Computing 604, 161-168, (2018), DOI:10.1007%2F978-3-319-60525-8_17 ISBN: 9783319605241

[7] Technical University of Varna, *General information*. Retrieved from: http://fs.tu-varna.bg/structure/ (Access on 8 April, 2020)

[8] Dovramadjiev T., *Advanced Technologies in Design*. Publisher Technical University of Varna, Bulgaria, pp. 228, 2017.

[9] Jurčević Lulić, T., Bratić, R. & Leder H. J., *A Method of Loads Assessment in the Knee Joint for Ergonomic Practice*, Proceedings of the 5th International Ergonomics Conference, Ergonomics 2013, Zagreb, Croatia, 211-216, 2013.

[10] Sušić, A., Jurčević Lulić, T. & Veljović, F., *Ergonomic Evaluation of Task Execution: Surface Electromyography*, Muscular Activity Screening, Periodicum biologorum, 112(1), 33-38, 2010.

[11] Jurčević Lulić, T., *Ergonomics and children's safety*, Paeditria Croatica, Volume 59, Supplement 1, 155-160, 2015.

[12] Čabradi, B., Ćurko, D., Jurčević Lulić, T., & Domljan, D., *Design of the school chair mechanism for Dynamic sitting*, Proceedings of the 6th International Ergonomics Conference „Ergonomics 2016 - Focus on Synergy", Zagreb, Croatia, 89-96, 2016.

[13] Sušić, A., Špehar, M., & Jurčevć Lulić, T., *Procedure for Correction of Lifting Task Posture for Injury Prevention*, Proceedings of the 5th International Ergonomics Conference, Ergonomics 2013, Zagreb, Croatia, 205-210, 2013.

[14] Cosoroaba, M. R., Cirin, L., Anghel, M. D., Talpos-Niculescu, C. I., Argesanu, V., Farkas, A. Z., & Negrutiu, M. L., *The use of thermal imaging in evaluating musculoskeletal disorders in dentists*, Journal of medicine and life, 12(3), 247, 2019.

[15] Kulcsar, R. M., Borozan, I., Argesanu, V., Maniu, I., Jula, M., Streian, F., ... & Nagel, A., *Modeling, simulation and experimental determination of the spine muscle's activities of the driver*, In Applied Mechanics and Materials, vol. 760, 159-166, 2015.

[16] Cirjaliu, B., Mocan, A., Boatca, M. E., & Drăghici, A., *A propose approach for continuous improvement using ergonomics and quality management knowledge and methodologies,* Quality Access to Success, 20(S1), 135, 2019.

[17] Boatca, M. E., Draghici, A., & Carutasu, N., *A knowledge management approach for ergonomics implementation within organizations*, Procedia-Social and Behavioral Sciences, 238, 199-206, 2018.

[18] Mocan, A., & Draghici, A., *A Proposed Ergonomics Maturity Level Framework and Assessment Tool*. Innovation in Sustainable Management and Entrepreneurship, 357, 2019.

[19] Mocan, A., Draghici, A., & Mocan, M., *A way of gaining competitive advantage through ergonomics improvements in warehouse logistics*. *Res. & Sci. Today*, *13*, 7, 2017.

[20] Draghici, A., Ivascu, L., Gaureanu, A., & Mocan, A., *The ergonomics interventions evaluation. A study based on usability,* MATEC Web of Conferences, Vol. 121, p. 11008, 2017.

[21] Gaureanu, A., Draghici, A., Dufour, C., & Weinschrott, H., *The Organizational Safety Culture Assessment*. In International Conference on Human Systems Engineering and Design: Future Trends and Applications (pp. 728-734). Springer, Cham, 2018.

[22] UB-FME, *Mechanical Engineering - University of Belgrade booklet*. Retrieved from: https://www.mas.bg.ac.rs/_media/eng/education/bsc/ub-fme-booklet.pdf (Access on 12 April, 2020)

[23] Labus, N. & Gajšek, B., *Use of ergonomic principles in manual order picking systems*. Logistics & sustainable transport, 9(1), 11-22, 2018.

[24] Gajšek, B., Đukić, G., Butlewski, M., Opetuk, T., Cajner, H., & Kač, S. M., *The impact of the applied technology on health and productivity in manual "picker-to-part" systems*. Work, (Preprint), 1-12, 2020.

[25] Gajšek, B., Cajner, H., Butlewski, M., Đukić, G., *Towards balanced productivity and ergonomics in the pursuit of lean warehousing,* In: N. Štefanić & H. Cajner (Eds.). Lean spring summit 2019: conference proceedings. Zagreb: Culmena, 113-115, 2019.

[26] Vujica-Herzog, N., Buchmeister, B., Beharić, A., & Gajšek, B., *Visual and optometric issues with smart glasses in Industry 4.0 working environment*. Advances in production engineering and management, 13(4), 417-428, 2018.

[27] Vidovič, E., & Gajšek, B. (2020). *Analysing picking errors in vision picking systems*, Logistics & sustainable transport, 11(1), 90-100, 2020.

[28] Gajšek, B., Vujica-Herzog, N., *Smart glasses in sustainable manual order picking systems*. In: K. Grzybowska, A. Awasthi, R. Sawhney (Eds.) Sustainable logistics and production in Industry 4.0: new opportunities and challenges, 219-241, 2020.

[29] Gajšek, B., Vujica-Herzog, N., Butlewski, M., Đukić, G., *Research opportunity: incorporation of human factors in order picking system models*. Zeszyty Naukowe Politechniki Poznańskiej: Organizacja i Zarządzanie [Print ed.], no. 72, 45-61, 2017.

[30] Pinter, R., Čisar, S. M., Balogh, Z., & Manojlović, H., *Enhancing Higher Education Student Class Attendance through Gamification*. Acta Polytechnica Hungarica, 17(2), 2020.

[31] Molnár, G., Nagy, K., & Balogh, Z., *The role and impact of visualization during the processing of educational materials, presentation options in education and in the virtual space*. In 2019 10th IEEE International Conference on Cognitive Infocommunications (CogInfoCom), 533-538, 2019.

[32] Turčáni, M., & Balogh, Z., *Technological Support of Teaching in the Area of Creating a Personalized E-course of Informatics*, In International Conference on Interactive Collaborative Learning, Springer, Cham, 38-49, 2019.

Prezentarea rețelei regionale educaționale CEEPUS în domeniul ergonomie și factorului uman

Rezumat: *Rețeaua regională educațională CEEPUS în domeniul ergonomie și factorului uman a fost înființată și aprobată spre finanțare ca urmare a colaborării între nouă universități cu rol esențial în predarea și cultivarea cunoașterii ergonomice și a profesiei de ergonomist (cu precădere în domeniul industriei și al sistemelor logistice). Universitățile prestigioase participante de la Belgrad, Budapesta, Krems, Maribor, Nitra, Poznan, Timișoara, Varna și Zagreb își propun să promoveze cooperarea în cercetare (asigurarea suportului pentru realizarea de programe doctorale, publicații științifice și didactice comune) și în educație, la nivelul cerințelor și standardelor Europeane, dar cu focalizare în special în regiunea Dunării. Obiectivul rețelei este de a facilita, încuraja și sprijini educația, cercetarea și profesiile în domeniul ergonomiei și al factorului uman, în principal prin mobilități, îndrumarea și suportul comun al programelor doctorale (în conformitate cu legislația, normele și regulamentele existente în fiecare universitate parteneră), iar pe termen lung este vizată crearea unei pregătiri doctorale comune în domeniu.*

Gyula SZABÓ, Assoc. Prof., PhD, Eur. Erg., Óbuda University Donát Bánki Faculty of Mechanical and Safety Engineering, Népszinház utca 8. Budapest, Hungary, szabo.gyula@bgk.uni-obuda.hu.
Zoltán BALOGH, Prof., doc. Ing. PhD., Constantine the Philosopher University in Nitra, Faculty of Natural Sciences, Trieda Andreja Hlinku 603/1, 949 4 Nitra, Slovacia, zbalogh@ukf.sk
Tihomir DOVRAMADJIEV, Assoc. Prof., PhD Eng. Technical University of Varna, Faculty of Shipbuilding, Studentska 1, 9000, Varna, Bulgaria, tihomir.dovramadjiev@gmail.com
Anca DRAGHICI, Prof., PhD. Eng., Politehnica University of Timisoara, Faculty of Management in Production and Transportation, 14 Remus str., 300191 Timisoara, Romania, anca.draghici@upt.ro
Brigita GAJŠEK, Assist. Prof., PhD, University of Maribor, Faculty of Logistics, Mariborska cesta 7, 3000 Celje, Slovenia, brigita.gajsek@um.si
Tanja Jurčević LULIĆ, Prof., PhD, University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture, Ul. Ivana Lučića 5, 10000, Zagreb, Croația, tanja.jurcevic.lulic@fsb.hr
Michael REINER, Prof., (FH) Mag., IMC University of Applied Sciences Krems, International Relations, Campus Krems, 3500 Krems an der Donau, Austria, michael.reiner@fh-krems.ac.at
Beata MRUGALSKA, Assist. Prof., PhD, DSc, Eng. Eur Erg., Poznan University of Technology, Faculty of Engineering Management, 11 Strzelecka, 60965 Poznan, Poland, beata.mrugalska@put.poznan.pl
Aleksandar ZUNJIC, Prof. Dr., University of Belgrade, Faculty of Mechanical Engineering, Kraljice Marije 16, Beograd, Serbia, azunjic@mas.bg.ac.rs