CEEPUS Network "Building Knowledge and Experience Exchange in CFD" -Long Program Description-

1. Introduction

The CEEPUS network "Building Knowledge and Experience Exchange in CFD" aims to promote excellence, mobility, innovation, and collaboration among universities, research institutions, and professionals in the field of Computational Fluid Dynamics (CFD) through a wide range of activities and partnerships across the Danube and Central European regions. The network addresses regional challenges related to the implementation of CFD in education, research, and engineering for the purposes of designing various products and systems, improving energy efficiency, and reducing their environmental impact. Through a variety of activities and interdisciplinary cooperation, the network provides a platform for sharing knowledge and expertise in the field of CFD. One of the core goals of the network is to create well-organized opportunities for young researchers, early-career academics, and women in science, ensuring their equal participation, recognition, and inclusion in all activities.

2. Goals of the network

The goals of the network are:

- Enhancing education and teaching quality by developing innovative teaching formats, joint courses, and textbooks.
- Supporting mobility and exchange through structured mobility pathways, laboratory shadowing, seasonal schools, and co-supervised theses.
- Strengthening research collaboration by establishing long-term partnerships, submitting joint research project proposals, and publishing joint scientific papers.
- Promoting and expanding the use of CFD by actively raising awareness, increasing visibility, and fostering broader adoption of CFD in education, research, and industry.
- Promoting inclusiveness and opportunities for young researchers and women by ensuring balanced participation and providing targeted training, mentoring, and leadership development opportunities.

3. Network components and activities

The program is structured around four major pillars: Lectures, Summer and Winter Schools, Thesis Supervision, and Research Collaboration. Each pillar includes ongoing activities as well as planned future enhancements.

3.1 Lectures

Lectures represent one of the central pillars of the network, providing a structured framework for sharing knowledge and strengthening academic cooperation across all participating units. The network promotes the active involvement of professors by encouraging them to announce their lectures in advance and upload teaching materials, scripts, publications, and other resources to a unified digital learning platform accessible to all members. This approach improves transparency, ensures better preparation of incoming students, and supports the development of digital competencies. The network also plans to expand the use of hybrid teaching formats, allowing lecturers to combine in-person and

online delivery. Through these activities, the lecture pillar strengthens collaboration, supports mobility, and contributes to the dissemination of state-of-the-art CFD knowledge across the entire region.

3.2 Summer and Winter Schools

Summer and Winter Schools represent key educational activities of the network, providing intensive training in CFD through lectures, laboratory visits, and hands-on exercises. The Summer and Winter Schools of CFD have been traditionally organized since the very beginning of the network implementation. They bring together students, young researchers, and teachers from numerous partner institutions, enabling them to deepen their theoretical knowledge while gaining practical skills in modern CFD tools. These schools also foster international cooperation by bringing together experts from different universities, encouraging multidisciplinary discussions, and initiating new joint research topics. A structured registration system will be introduced to improve organization and ensure adequate facilities and resources for all participants. The events are further enriched through keynote lectures by invited international experts, which help increase the visibility and impact of the network. It is worth mentioning that students receive a certificate of participation and earn 2 ECTS credits upon completion.

3.3 Thesis Supervision

Thesis Supervision represents an essential pillar of the network, fostering close cooperation between partner institutions through joint mentoring of BSc, MSc, and PhD theses. Through the "Collaborative Development of PhD Theses" model, students receive guidance from supervisors at different universities, enabling them to conduct research in well-equipped laboratories, access advanced methodologies, and benefit from international academic expertise. This joint supervision framework supports the development of high-quality research, strengthens cross-border collaboration, and helps students integrate CFD into their scientific work. Regular communication, online consultations, and coordinated evaluation procedures ensure that research progress is continuously monitored and recognized at both home and host institutions.

3.4 Research Collaboration

Research collaboration within the network is continuously expanding through the development of new joint project proposals and coordinated scientific activities. Through coordinated efforts, members jointly develop research topics, prepare project proposals, and publish scientific papers using CFD. The network encourages cross-border teamwork by connecting experts with complementary skills and facilitating access to shared laboratories and computational resources. Regular consultations, meetings, and exchanges help sustain continuous progress and support the development of high-quality, internationally relevant research outputs. The network also actively integrates CFD with artificial intelligence to address advanced topics in fluid mechanics, thermodynamics, and thermal engineering. In all of these initiatives, the network emphasizes energy efficiency, environmentally responsible technologies, and solutions aligned with the principles of the circular economy.

4. Support for Young Researchers and Women in Science

The network places a strong focus on inclusiveness and equal opportunities by actively supporting young researchers and women in science. Through targeted promotion, access to well-equipped laboratories, and involvement in highly relevant research topics, the network encourages their active participation in all exchanges and activities. Coordinators regularly present opportunities during

lectures and meetings, while mentoring, training, and joint research initiatives further support their professional development. This approach ensures balanced representation across institutions and enables young researchers and women to apply CFD in their work under the guidance of experienced experts. Through these measures, the network ensures meaningful participation, increased visibility, and long-term professional development for early-career scientists and women in science.

5. Long-term impact

The long-term impact of this CEEPUS network is expected to extend far beyond the immediate academic year and contribute to sustainable scientific, educational, and societal development in the region. The planned activities will lead to:

- Stronger integration and modernization of CFD-related curricula across Central and South-East Europe, resulting in harmonized teaching practices and enhanced digital and analytical competencies among students.
- A new generation of highly skilled engineers and researchers trained in advanced computational methods, capable of applying CFD to real-world challenges in energy efficiency, environmental protection, and industrial product and system design.
- Increased joint scientific output and long-term research collaborations, including cross-border project proposals, coordinated PhD supervision, and multidisciplinary initiatives combining CFD, AI, and experimental approaches.
- A stable and sustainable platform for academic mobility and cooperation, connecting institutions through regular exchanges, winter and summer schools, workshops, and joint programs.
- Broader adoption and visibility of CFD in the region, contributing to technological innovation, greener engineering solutions, and growth of research capacity in countries with limited access to advanced CFD infrastructure.
- Greater inclusiveness and empowerment of young researchers and women in science, ensuring balanced participation and fostering leadership roles through mentoring, training, and priority mobility opportunities.

6. Conclusion

The CEEPUS network “Building Knowledge and Experience Exchange in CFD” integrates high-quality teaching, practical skills development, advanced research collaboration, and strong support measures for young scientists and women in science into a unified regional framework. Through innovative lecture formats, dynamic winter and summer schools, structured mobility, joint supervision of theses, and coordinated research initiatives, the network enhances regional expertise in Computational Fluid Dynamics. By fostering interdisciplinary cooperation, expanding digital competencies, and strengthening cross-border partnerships, the network contributes to long-term academic development and prepares a new generation of CFD specialists capable of addressing emerging engineering and environmental challenges.