

Activity Report - EMERALD International Summer School (August 28 - September 4, 2023)

Within the project 21-COP-0019 - EMERALD, funded by Norwegian grants, at the University of Agder (Grimstad, Norway) it was organized the international summer school entitled "Virtual e-learning Platform Experience in Bio-mechatronics". 40 participants (professors, researchers, and students) coming both from the EMERALD project consortium (Technical University of Cluj-Napoca (Romania) - as the leading institution of the EMERALD project, University Politehnica of Bucharest (Romania), Poznan University of Technology (Poland) and the BIZZCOM s.r.o. company from Slovakia) and outside the EMERALD project consortium (participants from Latvia and Sweden) have attended to this significant event. The main objective of the event was to share knowledge and best practices in the field of VR, AR and Mixed Reality applications, these applications being intended to be integrated within the e-learning platform that has been developed in the frame of the 21-COP-0019 - EMERALD project. The e-learning platform that has been developed aims to provide to those who are interested the knowledge and skills that are necessary for the developing, manufacturing and testing of bio-mechatronic systems for people with special needs (amputated arms) that can be made using modern manufacturing methods such as 3D printing technologies.



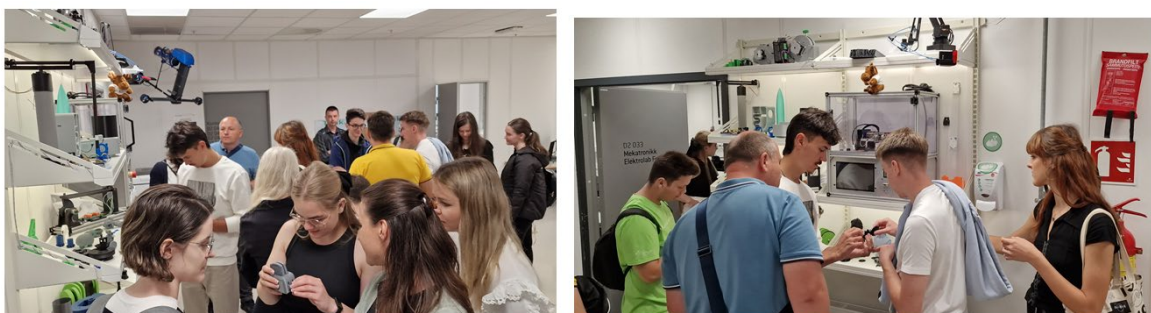
A significant highlight of this event was the presence at the opening ceremony of Mr. Silviu Jipa, Minister Counselor, chief collaborator, representing the Romanian Embassy in Norway. He provided insightful perspectives on the future development of bilateral relations between Romania and Norway, as well as ideas on continuing the educational and research themes which have been addressed within the 21-COP-0019 EMERALD project. He also discussed the possibilities of leveraging these ideas with the support of companies interested in exploiting these ideas and in investing in these systems in the future.



At the same time, one very important presence at this event was the one of Ms. Vice-Rector for Education, Prof. Dr. Hilde Inntjore from the University of Agder. She introduced the University of Agder's vision on values rooted in collaborative learning, as well as elements of innovation and creativity that is stimulating collaborations in between higher education institutions. This includes partnerships that the University of Agder has developed with other higher education institutions in Europe, such as those involved in the 21-COP-0019 EMERALD project.



The opportunity to visit the laboratories of the University of Agder (Grimstad, Norway) was particularly significant for both students and professors, in the effort of identifying new collaboration opportunities within the EMERALD consortium concerning the developing of joint new research ideas that support the conceiving and realizing of innovative bio-mechatronic systems for people with special needs / with amputated arms, using the resources and logistics that are available at the partner institutions involved in the 21-COP-0019 - EMERALD project.

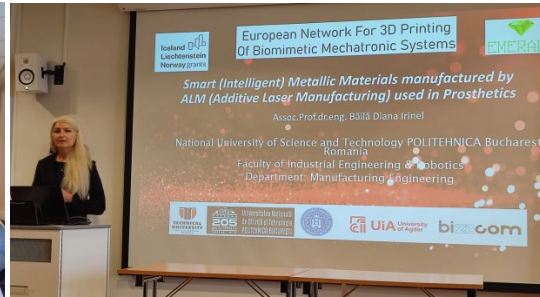
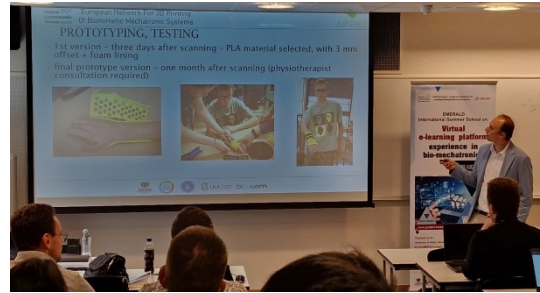




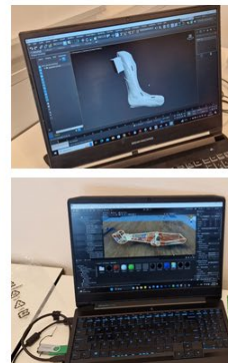
From the technical and practical point of view, during the EMERALD international summer school organized at the University of Agder (Norway), attendees had the chance to participate in a series of lectures. These lectures were delivered by various specialists (professors and researchers) in the field of VR/AR/Mixed Reality applications. Such modern elements, like VR/AR/Mixed Reality applications are aimed to be integrated into the "e-learning Platform with applicability in the field of bio-mechatronics" that has been conceived and developed within the EMERALD project.



Additionally, a series of lecture presentations were made by the members of the EMERALD project consortium, delving into broader areas that are associated with the design, manufacturing, and testing of bio-mechatronic systems for people with special needs (amputated arms). These areas include parametric design of such systems, finite element analysis, bio-mechatronics, smart and intelligent materials, dimensional accuracy, Tolerances and Control, product Aesthetics, etc.

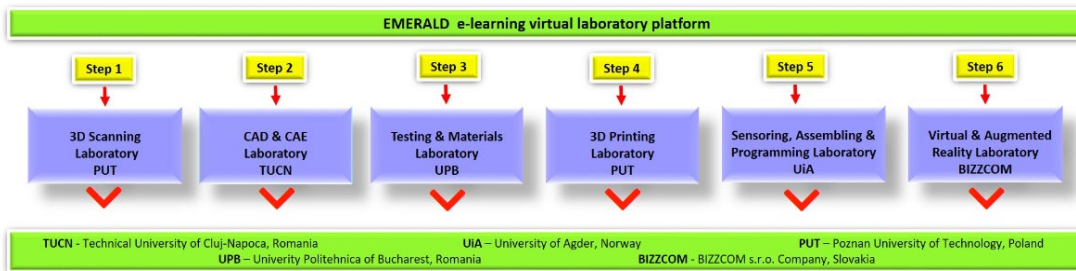


The lectures that have been held during the International Summer School were deeply practical in nature, with students having the opportunity to work in small groups and having the opportunity apply the knowledge that they have been acquired in designing and developing of various types of VR/AR and Mixed Reality applications that have been specifically conceived for people with special needs (with amputated arms) – for real patients - during the International Summer School organized at the University of Agder - Grimstad (Norway) in this period.





The applications that have been conceived and developed by the students were integrated within the e-learning platform that has been realized within the 21-COP-0019 - EMERALD project - https://project-emerald.eu/?page_id=404. This platform has been experimentally tested by the students during the summer school, aiming to evaluate and understand each step needed concerning the designing manufacturing and testing of bio-mechatronic systems for people with special needs (with amputated arms). This process is starting with the 3D scanning of patients and then is continuing with the following important stages, such as the computer-aided design (CAD), computer aided engineering (CAE), material testing and characterization, 3D printing, sensorizing, assembling and programming, VR & AR, etc.



At the conclusion of the EMERALD International Summer School, students took a final test and also had the opportunity to provide feedback and suggestions, as well as new ideas regarding the integrating of new applications or elements into the virtual e-learning platform with applicability in the field of bio-mechatronics, platform that has been developed within the EMERALD project.



Additionally, students had the opportunity to give individual presentations on various thesis topics that were undertaken in the previous academic year, under joint supervision, with the support of professors from the EMERALD consortium. They also had the chance to give group presentations to share ideas and results obtained from their team efforts during the 2023 edition of the EMERALD International Summer School organized at the University of Agder (Grimstad, Norway).



Following the students' presentations, valuable feedback and ideas for continuing the research were provided by the EMERALD professors who supervised the presented theses. Significant discussions were held by professors within the EMERALD consortium with the idea of supporting students to benefit from coordination and assistance from the consortium members concerning future joint-supervised thesis projects. No fewer than 10 such thesis projects focused on creating bio-mechatronic systems for individuals with special needs/amputated arms have already been conceived and developed for real patients, by utilizing the educational and research resources that have been developed within the EMERALD project during its implementation period.

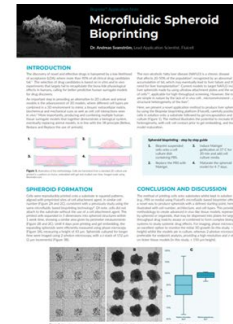
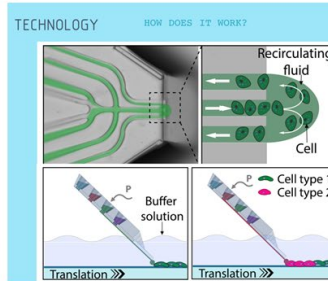


In order to recognize the quality of work and effort put in by the students, as well as to appreciate their achievements during the summer school, all participants of this edition of the EMERALD International Summer School have received certificates bearing the logo of the Norwegian grants. These certificates were signed by representatives of the University of Agder – Grimstad – Norway.



The feedback received from the participants of the 2023 EMERALD International Summer School edition, following the testing and experiencing of the virtual e-learning platform with applicability in the field of bio-mechanics, developed within the EMERALD project, concerning the quality of the educational materials presented and the applications included within the platform were highly valuable to the members of the EMERALD consortium. All suggestions provided by participants will be used for improving/updating of the existing platform in the future.

A significant advantage of the summer school organized at the University of Agder – Grimstad (Norway) was the support and presence at this event of one of the most prestigious companies operating in the field of 3D bio-printing, Flucell from Gothenburg (Sweden). Flucell company also provided a series of feedback on the concepts developed by students under the supervising of professors that have participated at the EMERALD International Summer School."



Fluicell company also gave one presentation, highlighting the significant advancements that have been made in the field of printing human tissues or human skin grafts, as well as regarding some solutions that have been developed and can be integrated into the design and manufacturing of bio-mechatronic systems for people with special needs (amputated arms) in the future. A collaboration and partnership agreement has been signed with Fluicell company during the summer school by the members of the EMERALD project consortium who attended the event.



Based on these elements and the partnership agreement signed with Fluicell, as well as other partnership agreements that were signed during previous events organized within the EMERALD project, roundtable discussions were organized during the summer school in order to highlight various elements that are highly important to be used for the identifying of joint cooperation of the universities involved in the EMERALD project consortium and the companies who have signed the partnership agreements. Topics covered included the testing of new materials and products, research innovation, bioprinting, etc.



In conclusion, the summer school held at the University of Agder (Grimstad, Norway) in the period from August 28 to September 4, 2023, has contributed to the establishing of a strong foundation for new collaborations in the field of 3D printing with applicability to the bio-mechatronics domain, with the support of the European Network for 3D Printing of Biomimetic Mechatronic Systems – EMERALD, that has been constituted as one of the result of this project.



The e-learning platform specifically designed within the project 21-COP-0019 EMERALD, which aims to provide to everyone that are interested by this field the knowledge and skills that are needed for the developing, manufacturing and testing of bio-mechatronic systems for people with special needs (amputated arms) made through 3D printing - https://project-emerald.eu/?page_id=404 will remain open and will be freely accessible in the future. This e-learning platform is intended to serve as a solid foundation for identifying new needs and challenges in the field of bio-mechatronic systems manufacturing in the future, providing also opportunities for the realizing of BSc, Msc, PhD thesis in „co-supervising” regime or the developing of new educational and joint research projects by the EMERALD project partners - Technical University of Cluj-Napoca (Romania), University of Agder (Grimstad, Norway), National University of Science and Technology Politehnica Bucharest (Romania), Poznan University of Technology (Poland) and the company BIZZCOM s.r.o. (Slovakia) and other partners from higher education institutions or companies that might be interested in continuing the research directions that have been developed within the 21-COP-0019 – EMERALD project in the future.

Assoc. Prof. Dr. Eng. Răzvan Păcurar
Coordinator of the EMERALD Project 21-COP-0019
Technical University of Cluj-Napoca, Romania
Faculty of Industrial Engineering, Robotics, and Production Management,
Department of Manufacturing Engineering.