

European Network For 3D Printing Of Biomimetic Mechatronic Systems

Working together for a **green**, **competitive** and **inclusive** Europe

21-COP-0019

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This project has been funded with support from the SEE 2014-2015 financial mechanism. Its content (text, photo, video) reflects the views only of the authors and not the official opinion of the Program operator, national contact point or Financial Mechanism Office.

Content

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- 2. Main activities of the EMERALD project. General presentations of the Intellectual Outputs. Most important KPIs of the EMERALD project.**
- 3. Main actions of the EMERALD project. Summarizing of the calendar of the EMERALD project, milestones, etc.**
- 4. Q&A - comments and discussions**

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1. Main aims and details of the EMERALD project

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EMERALD project – EEA grants financed in the frame of SEE mechanism

The National Agency for Community Programmes in the Fields of Education and Vocational Training

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Selection Results – Cooperation projects

Round 2021 – APPROVED

No.	Reference number	Project title	Project Promoter	Town	Partner in Donor State	Final score	Requested budget (EUR)	Approved budget (EUR)
1	21-COP-0019	European network for 3D printing of biomimetic mechatronic systems	Universitatea Tehnica din Cluj-Napoca	Cluj-Napoca	University of Agder, NO	115	199,950	198,810
2	21-COP-0004	Bringing Real Life into Virtual Classrooms	Universitatea de Vest din Timisoara	Timisoara	Norwegian University of Science and Technology, NO	110	94,237	89,353

Total Budget:
198.810 EUR

Total Duration:
2 years

Starting date:
15.02.2022

Ending date:
30.09.2023

Education, Scholarships, Apprenticeships and Youth Entrepreneurship Programme financed by the EEA Financial Mechanism (2014 – 2021)

Coordinator



TU Cluj-Napoca (RO)

Partners from Higher Education institutions



University of Agder (NO)



Polytechnic University of Bucharest (RO)



Poznan Univ of Technology (PL)



(SK)



European Network For 3D Printing Of Biomimetic Mechatronic Systems

Scientific background and experience used to define the main aims
and expected outcomes of the EMERALD project

Providing **teaching resources and methods for professors** coming from the Higher Education institutions that are interested to find ways in **providing their students** relevant knowledge, skills and competences in **conceiving, developing and realizing of different biomimetic mechatronic systems by 3D printing methods for people with special needs (amputated arms)**, such as:

- EMERALD **support e-courses** related to the objective (based on one curriculum defined by the EMERALD consortium)
- EMERALD **e-toolkit manual** for digital learning (correlated with the support courses)
- EMERALD **e-learning virtual laboratory** platform for developing, producing and testing of biomimetic mechatronic systems made by 3D printing (in correlation with the support e-courses and the e-toolkit manual)
- EMERALD **e-case studies** for project based learning method used in developing, testing and manufacturing of new types of biomimetic mechatronic systems made by 3D printing technologies for people with special needs (amputated arms)

The advantages of the EMERALD methods will be that the **professors and students will gain knowledge and competences related to the developing, designing, producing of biomimetic mechatronic systems made by 3D printing methods and testing of developed systems that are aimed to support people with special needs (amputated arms) in the end.**

European Network For 3D Printing Of Biomimetic Mechatronic Systems

Background of the EMERALD project interdisciplinary domains / interconnections with previous EEA grants



ARM NEUROPROSTHESIS EQUIPED WITH ARTIFICIAL SKIN AND SENSORIAL FEEDBACK - ARMIN

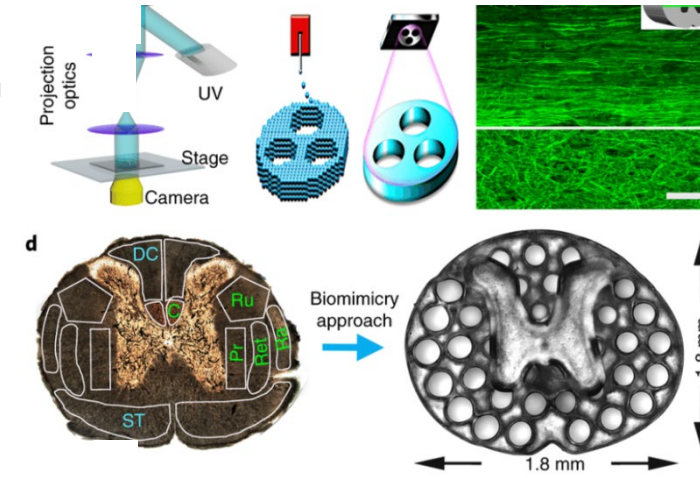
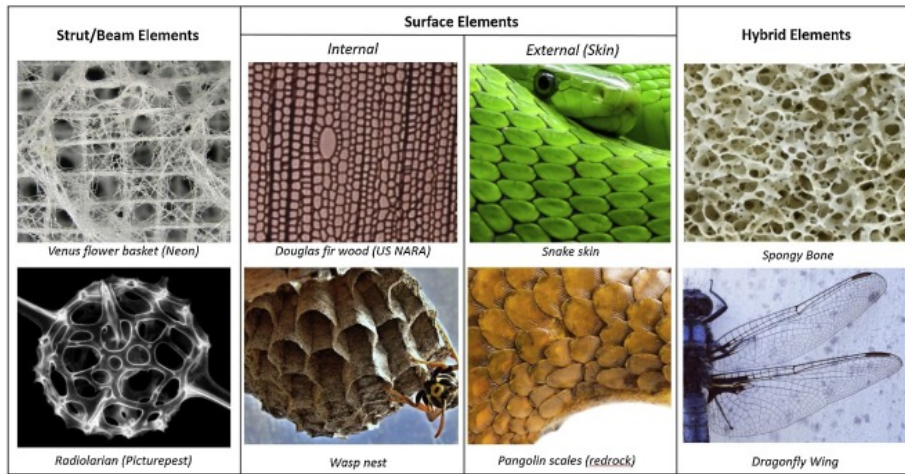
Partners: **UPB**, National Institute of Microtechnology, Clinical Hospital of Floreasca, Medical Science Academy, Areus Technology, University of South-Eastern Norway, budget approx. 1.510.000 euro

The main objective of the project was to design and fabricate the command and control system of a neuroprosthesis that integrates the motion algorithms with the command and sensory signals. The sensorial feedback system is re-establishing the sensorial function of amputated arms and is able to achieve high precision movements when handling objects with the neuroprosthesis. To design and fabricate a set of regenerative neural bio-interfaces for selecting and stimulating (from ulnar and median nerves), the sensory axons considered being in charge with the transmission of tactile sensations from palm and fingers, before amputation has been developed. These bio-interfaces allow the tactile signals from the fingers and palms of the neuroprosthesis to be transmitted through these sensory axons. In this way the patient actually feels tactile feedback sensations when handling objects with neuroprosthesis. To mount a fully functional neuroprosthesis on the patient stump, it was needed to be connected to the peripheral nervous system of the patient. For delivering the arm neuroprosthesis prototype (implanted in the patient stump and WiFi connected to the prosthesis hand), most of lost arm and hand functions were achieved by 3D printing.



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Background of the EMERALD project interdisciplinary domains / innovative things that are to be considered



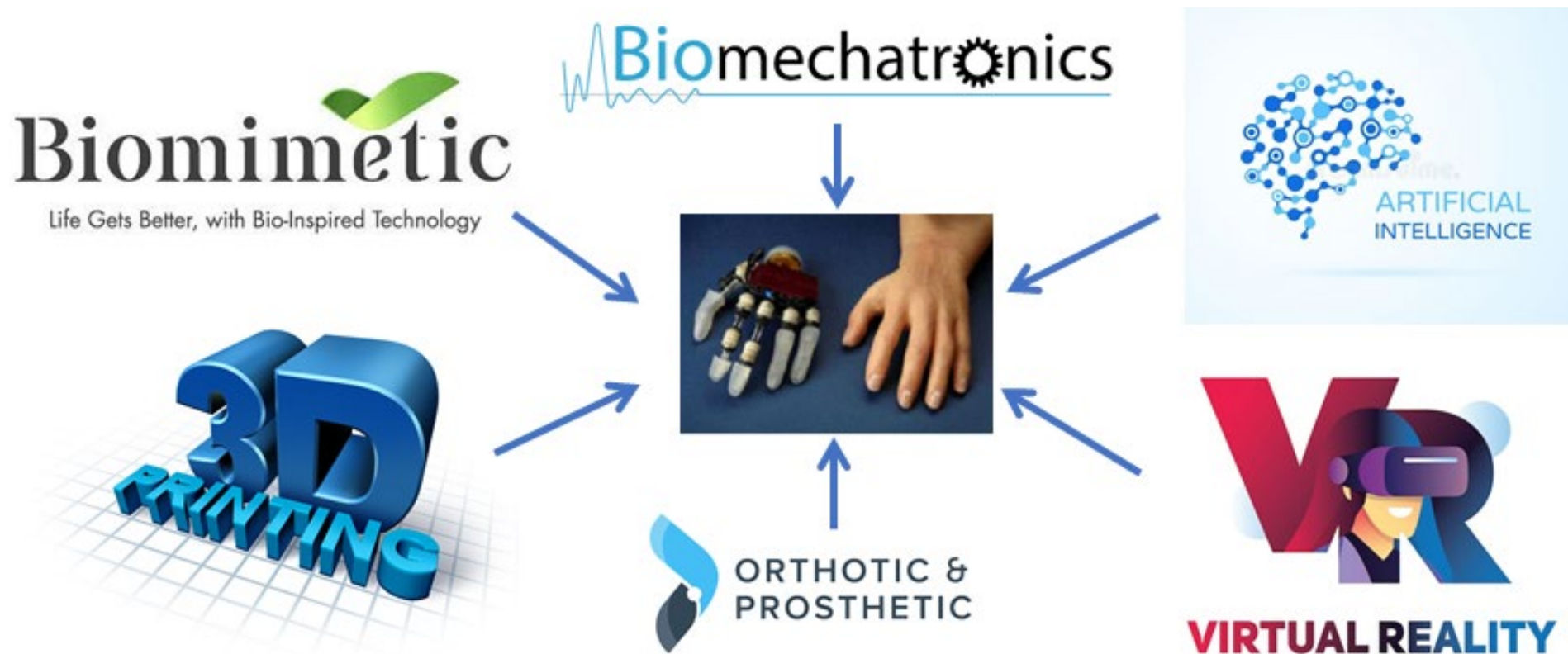
Biomimetic structures to be materialized by 3D printing methods

Definition: Biomimetic (biomimicry) refers to human-made processes, substances, devices, or systems that imitate nature.

The field is of top interest to researchers involved in 3D printing, nanotechnology, robotics, artificial intelligence, smart (intelligent) materials, medicine, industrial applications (aerospace industry, automotive, etc).

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Defining of the of the project idea and main concept

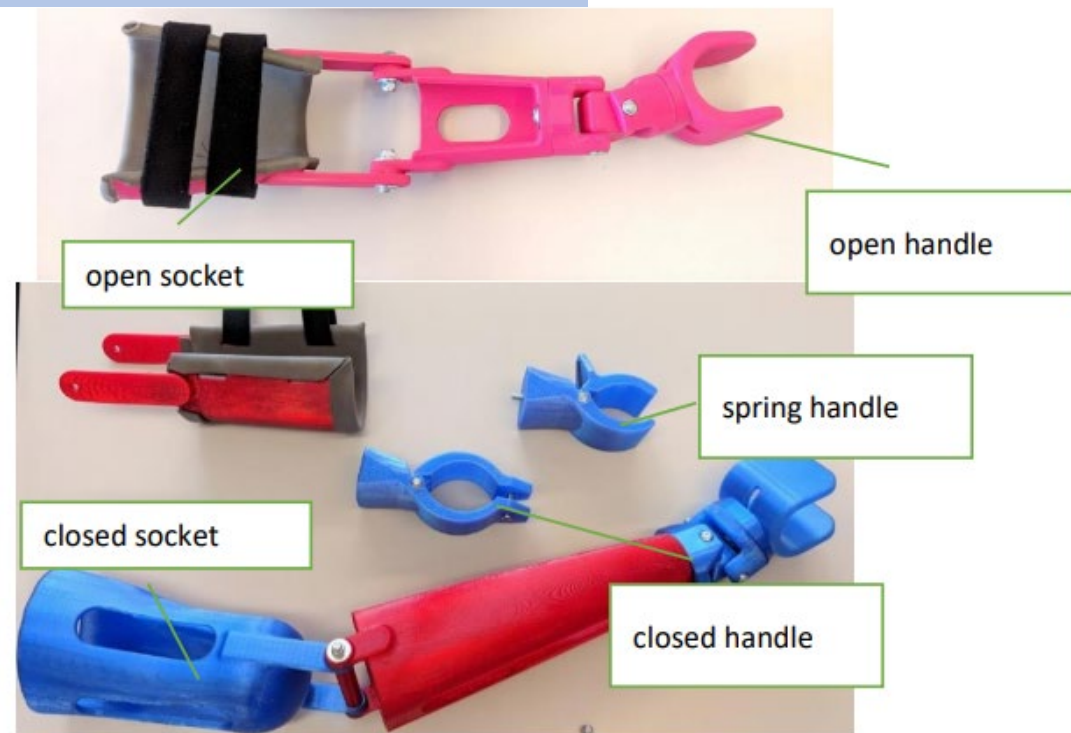


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Case studies proposed to be solved in the EMERALD project



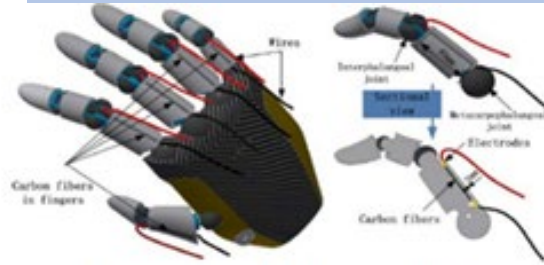
Bicycle prosthesis used by various patients [PUT project report]



Components of the bicycle prosthesis [PUT project report]

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Case studies proposed to be solved in the EMERALD project



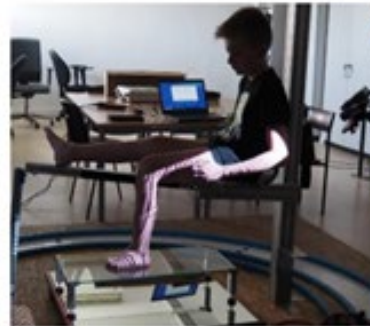
Universal prosthetic hand with mechanical fingers [PUT materials]



Corrective WHOs for patients with shoulder dystocia [PUT project report]



Orthyo sensors available at PUT [orthyo.com]



3D printed waterproof AFOs for patient with severe spina bifida



Therapy using VR applications (gamification)

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Target audience (groups) / relevant stakeholders to be involved in the project)

The EMERALD project proposal is addressing to **the professors and students** that are interested in gaining knowledge and competences related to the developing, designing, producing of biomimetic mechatronic systems made by 3D printing methods and testing of developed systems that are aimed to support people with special needs (with amputated arms). They are the main target audience / to whom the project is being addressing to.

People with special needs are beneficiaries (end users) of developed solutions in the EMERALD project (not target audience / to whom the project is addressed to).



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Target audience (groups) / relevant stakeholders to be involved in the project

Conceiving of the **European network for 3D printing of biomimetic mechatronic systems** is one objective of the project. This will be done by finding the proper ways to involve the major stakeholders in the project (Public organizations, Health / Medical institutions, 3D printing companies, SMEs, clusters), etc through the activities organized in the project (multiplier events, summer school activities). Stakeholders are the key actors that might benefit of the project results.



Involving of local authorities



Attracting of most important companies and organizations that are acting in 3D printing / bio-mechatronics sector – EMERALD aim is to build an EUROPEAN Network also



TUCN – strategic partner within the European University of Technology EuT+ (<https://www.univ-tech.eu/>) and ERASMUS+ programs



2. Main activities of the EMERALD project. General presentations of the Intellectual Outputs. Most important KPIs of the EMERALD project

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Quick overview of the Intellectual outputs related to the EMERALD project

IO1	EMERALD e-book for developing of biomimetic mechatronic systems	TUCN
IO2	EMERALD e-toolkit manual for digital learning in producing biomimetic mechatronic systems	<i>University of Agder</i>
IO3	EMERALD e-learning VR / AR platform for programming and using biomimetic mechatronic systems	<i>Bizzcom</i>
IO4	EMERALD e-case studies for project based learning method used in developing, testing and manufacturing of new biomimetic mechatronic systems by 3D printing technologies	<i>Poznan University of Technology</i>

European Network For 3D Printing Of Biomimetic Mechatronic Systems

I01 - EMERALD e-book for developing of biomimetic mechatronic systems

Start Date : 15 Feb 2022

End Date : 31 Jul 2022

Responsible: Technical University of Cluj-Napoca

The main aim of the I01 is to provide the proposed CURRICULUM for increasing the application of research results in regenerative medicine, human-machine interfaces, advanced robotics, new paradigms in biomimetic mechatronic systems, etc. The curriculum comprise 8 MODULES.

Open
access
on the
platform?

Content?

Template?

Report?

MODULES	RESPONSIBLES
1. Computer Aided Design (CAD)	PUT
2. Computer Aided Engineering (CAE)	TUCN
3. Computer Programming	UiA
4. Virtual Reality / Augmented Reality	PUT & BIZZCOM
5. Sensors and Electronics	UPB
6. Bio-Mechatronics	UiA
7. 3D printing and Rapid Tooling methods	TUCN
8. Intelligent (smart) materials	UPB

Starting:
15.02.2022

Deadline:
31.07.2022

For each module according to the skills and competences of the EMERALD partners consortium, from the Technical team there will be nominated 1-2 responsible persons which will be in charge with one module and will need to provide course support for the particular module courses necessary for producing biomechatronic / biomimetic systems.

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EMERALD

The Education, Scholarships, Apprenticeships and Youth
Entrepreneurship
EUROPEAN NETWORK FOR 3D PRINTING OF BIOMIMETIC
MECHATRONIC SYSTEMS

MODULE *number*
Name of Module

Project Title	European network for 3D printing of biomimetic mechatronic systems 21-COP0019
Output	IOI - EMERALD e-book for developing of biomimetic mechatronic systems
Module	Module *number* *Name of Module*
Date of Delivery	July 2022
Authors	
Version	FINAL VARIANT, *date*

This project has been funded with support from the Iceland-Liechtenstein-Norway Grants. This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

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Title of the presentation

Academic title or role in the company, Name and Surname,
Department,
Faculty / University / Company, country of origin

8 course modules comprising 30-40 pages each were finalized by the EMERALD consortium and are ready to be released in September 2022 on the EMERALD project website (platform)

Open-access book is about to be published soon

European Network For 3D Printing Of Biomimetic Mechatronic Systems

Quick overview of the Intellectual outputs related to the EMERALD project

I02 - EMERALD e-toolkit manual for digital learning in producing biomimetic mechatronic systems

Start Date : 01 Aug 2022 End Date : 31 Jan 2023

Responsible: University of Agder

The aims of the I02 : > to provide e-toolkit for teaching purposes
> to provide the basics knowledge about the realizing of biomimetic mechatronic systems by 3D printing.
> to provide the other preliminary and post processing steps that are required to be followed in terms of CAD modeling
> diploma project themes

Open access on the platform?

Conceiving the concepts of biomimetic mechatronic systems / bio-mechatronic domain

RESPONSIBLES

UiA

Starting:
01.08.2022

Providing details related to the designing solutions used for conceiving the biomimetic mechatronic systems

PUT & TUCN

Validation of the biomimetic mechatronic systems (solutions designed by CAD systems based on CAE analyses)

TUCN

Content?

Solutions related to the materials to be used for the realizing of the new developed biomimetic mechatronic systems

UPB

3D printing and rapid tooling methods for the components to be realized for the new biomimetic mechatronic

TUCN & UPB & PUT

Deadline:
31.01.2023

Template?

Description of assembling and programming of the systems

UiA

Report?

Aspects related to the set-up/functionality of the presented solutions/repeatability of the process /troubleshoot and control; inputs regarding the methods of testing of these new biomimetic mechatronic systems by AR / VR - solutions of conceiving, realizing and materializing of different scenarios in AR/VR where the biomimetic mechatronic systems will be connected and used for therapeutically purposes by the persons with special needs

BIZZCOM

For each module according to the skills and competences of the EMERALD partners consortium, from the Technical team there will be nominated 1-2 responsible persons which will be in charge with the module and will need to provide the module for the e-toolkit manual.

WORK IN
PROGRESS

WORK IN
PROGRESS

European Network For 3D Printing Of Biomimetic Mechatronic Systems

Quick overview of the Intellectual outputs related to the EMERALD project

I03 - EMERALD e-learning VR / AR platform for programming and using biomimetic mechatronic systems

Start Date : 01 Feb 2023 End Date : 31 Jul 2023

Responsible: BIZZCOM company

The aims of the I03 : > the realization of a Virtual laboratory (e-learning) platform, that integrates VR / AR applications which can be accessed by professors and students

> Programming and realizing of different scenarios in VR / AR / Mixed Reality, conceiving of different applications that can be connected with AR / VR (applications that can be downloaded at home)

> Applications developed by professors and students will be uploaded on the EMERALD platform

		RESPONSIBLES
Open access on the platform?	Designing of different scenarios, the programming of the biomimetic mechatronic systems	BIZZCOM Company
	Preparing the e-library of the developed e-learning platform & aspects that are required to be followed by professors & students Hints & tips about regulations in modeling, selecting of the adequate materials, manufacturing solutions & assembling of such biomimetic mechatronic systems	TUCN & PUT & UPB
Content?	The project themes that are required for people with special needs & particularities of these types of topics	UiA / all partners
	Logistics in terms of materials selecting, CAD, CAE, manufacturing & assembling of the new developed systems	TUCN & PUT & UPB
Report?	Potential stakeholders that are interested by the solutions developed by the EMERALD consortium	BIZZCOM
	Feedbacks and recommendations	BIZZCOM/ all partners

Starting:
01.02.2023

Deadline:
31.07.2023

For each room according to the skills and competences of the EMERALD partners consortium, from the Technical team there will be nominated 1-2 responsible persons which will be in charge with the virtual room and will need to provide the informations for the virtual room of the virtual laboratory.



European Network For 3D Printing Of Biomimetic Mechatronic Systems

Quick overview of the Intellectual outputs related to the EMERALD project

I03 - EMERALD e-learning VR / AR platform for programming and using biomimetic mechatronic systems

Start Date : 01 Feb 2023 End Date : 31 Jul 2023

Responsible: BIZZCOM company

The aims of the I03 : > the realization of a Virtual laboratory (e-learning) platform, that integrates VR / AR applications which can be accessed by professors and students

> Programming and realizing of different scenarios in VR / AR / Mixed Reality, conceiving of different applications that can be connected with AR / VR (applications that can be downloaded at home)

> Applications developed by professors and students will be uploaded on the EMERALD platform

		RESPONSIBLES
Open access on the platform?	Designing of different scenarios, the programming of the biomimetic mechatronic systems	BIZZCOM Company
	Preparing the e-library of the developed e-learning platform & aspects that are required to be followed by professors & students Hints & tips about regulations in modeling, selecting of the adequate materials, manufacturing solutions & assembling of such biomimetic mechatronic systems	TUCN & PUT & UPB
Content?	The project themes that are required for people with special needs & particularities of these types of topics	UiA / all partners
	Logistics in terms of materials selecting, CAD, CAE, manufacturing & assembling of the new developed systems	TUCN & PUT & UPB
Report?	Potential stakeholders that are interested by the solutions developed by the EMERALD consortium	BIZZCOM
	Feedbacks and recommendations	BIZZCOM/ all partners

Starting:
01.02.2023

Deadline:
31.07.2023

For each room according to the skills and competences of the EMERALD partners consortium, from the Technical team there will be nominated 1-2 responsible persons which will be in charge with the virtual room and will need to provide the informations for the virtual room of the virtual laboratory.



European Network For 3D Printing Of Biomimetic Mechatronic Systems

Quick overview of the Intellectual outputs related to the EMERALD project



Virtual platform laboratory (360 photos of the institutions involved in the EMERALD project)



European Network For 3D Printing Of Biomimetic Mechatronic Systems

Quick overview of the Intellectual outputs related to the EMERALD project



Virtual platform laboratory (with elements of VR/AR integrated and considered also in the platform)



European Network For 3D Printing Of Biomimetic Mechatronic Systems

Quick overview of the Intellectual outputs related to the EMERALD project

I04 - EMERALD e-case studies for project based learning method used in developing, testing and manufacturing of new biomimetic mechatronic systems by 3D printing technologies
 Start Date : 15 Feb 2022 End Date : 29 Sep 2023
 Responsible: Poznan University of Technology

The main aim of the I04 : ➤ the implementation of the communication and dissemination strategy for increasing awareness, understanding and engagement with users and target groups
 ➤ 4 CASE STUDIES of biomimetic mechatronic systems made by 3D printing for people with special needs.

Open access on the platform?

Content?

Template?

Report?

	RESPONSIBLES
Designating of one person from each technical team of the EMERALD consortium as MENTOR for the students which will work on these topics.	UiA & TUCN & UPB& PUT
Selection of the 4 case studies	PUT / all partners
3 different TEAMS comprising 5-7 students from different countries of the consortium will start to work on the topic, starting from the CAD & CAE methods	all partners
Validation of the solutions proposed by the students	all partners
Selection of the material and 3D printing process by the students	UPB & TUCN & PUT
Programming tests & procedures	UiA & BIZZCOM
Final feedback	UiA

Starting:
15.02.2022

Deadline:
29.09.2023

For each case study according to the skills and competences of the EMERALD partners consortium, from the Technical team there will be nominated 1-2 responsible persons. 3 different teams comprising 5-7 students from different countries of the consortium will start to work on the topic. Validation of the solutions proposed by the students will be made with the help of their mentor (responsible professor of the EMERALD consortium) .



European Network For 3D Printing Of Biomimetic Mechatronic Systems

Main KPIs of the EMERALD project

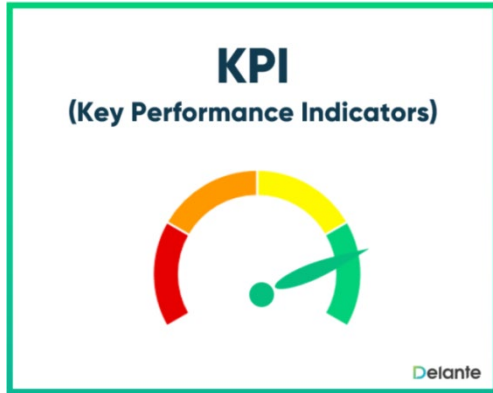
104 - EMERALD e-case studies for project based learning method used in developing, testing and manufacturing of new biomimetic mechatronic systems by 3D printing technologies

RESULTS (KPIs):

- ✓ 4 case study reports
- ✓ 1 open access book
- ✓ 1 open access toolkit manual
- ✓ 4 academic / scientific papers (ISI with Impact factor) are expected to be delivered at the end and shared via a-platform of EMERALD project as good practice use for dissemination
- ✓ e-learning platform conceived by the EMERALD consortium is intended to be used finally as one powerful tool for attracting the major stakeholders in the field of bio-mechatronics /3D printing domains) to scale up the solutions to build one active and representative network for 3D printing of biomimetic mechatronic systems in Europe (EMERALD network)

DISSEMINATION:

1. **Chapters that might be used by students for BSc projects / reports** that emphasize the case studies and use of EMERALD resources in developing, producing or testing new types of biomimetic mechatronic systems by 3D printing (reports will be shared via the e-learning platform of EMERALD project in open-access mode in order to emphasize how EMERALD resources were used in sorting out real issues in close correlation with the persons with special needs I adapted for these case studies);
2. **Case studies developed, tested and made at this level** will provide important feedbacks regarding the EMERALD resources and regarding the new biomimetic mechatronic systems developed for people with special needs.
3. Since topic of the EMERALD project and content is in the interest of SMEs and Medical Institutions, **transfer of know-how from the universities engaged in the EMERALD consortium to stakeholders**, as well as building strategic partnerships and **applying for new EU projects** is highly foreseen to be reached at dissemination level in the future as well.
4. **patenting process of the solutions developed by the EMERALD consortium** (patent submitting application)
5. **Advertising is not for dissemination**, but is needed for promoting of the consortium and events (logo of the project, advertising, web page, newspapers) etc.



European Network For 3D Printing Of Biomimetic Mechatronic Systems

Disseminating plan /conceived for the EMERALD project

DISSEMINATION PLAN



EMERALD
The Education, Scholarships, Apprenticeship and Youth Entrepreneurship
EUROPEAN NETWORK FOR 3D PRINTING OF BIOMIMETIC MECHATRONIC SYSTEMS
MODULE *number*
Name of Module

Project Title	European network for 3D printing of biomimetic mechatronic systems 714704819
Output	EM - EMERALD eBook for developing of biomimetic mechatronic systems
Module	Module "number" *Name of Module*
Date of Delivery	July 2022
Authors	
Version	FINAL VARIANT, *date*



Article

Mechanical and Wetting Properties of Ta₂O₅ and ZnO Coatings on Alloy Substrate of Cardiovascular Stents Manufactured by Casting and DMLS

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Publishing of EMERALD books and ISI articles



European Network For 3D Printing Of Biomimetic Mechatronic Systems

Disseminating plan /actions / involving stakeholders that are interested for the EMERALD project

DISSEMINATION PLAN



Manufacturing 2022
ISI conference



Springer Publishing House



Participating and publishing articles at important scientific conferences and other important events



3. Main actions of the EMERALD project. Summarizing of the planned actions

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European Network For 3D Printing Of Biomimetic Mechatronic Systems

Main actions of the EMERALD project

TPM	Transnational project meetings
ME	Multiplier Events
C	Intensive Programmes for higher education / Short-term joint staff training events
EMERALD - Summarizing the Calendar of the project / deadlines / milestones	

European Network For 3D Printing Of Biomimetic Mechatronic Systems

EMERALD – Kick off meeting – 28.02.2022 – TUCN, RO



European Network For 3D Printing Of Biomimetic Mechatronic Systems

EMERALD – Kick off meeting – 28.02.2022 – TUCN, RO

The event was **organized at the Technical University of Cluj-Napoca**, together with the Executive team (1 representative of each institution that is involved in the consortium) + 1 representative of the Technical Team, with **the main goals:**

- ▶ to discuss about the logistic aspects involved in the project and to make presentations that were prepared prior in advance about Institutions involved in the project, infrastructure, key personnel that will be involved in the project (constituting of the Financial team, Technical Team, Communication team)
- ▶ as results of this meetings there are foreseen to reach a clear Project management plan, financial management plan, dissemination plan like the one in the Annexes, to discuss and establish the main key outputs, to present the regulations stated by the Romanian National Agency, quality assurance and risk management plan, etc.

European Network For 3D Printing Of Biomimetic Mechatronic Systems

EMERALD – Monitoring Transnational Meeting - TPM 2 - August 2022 - University Politehnica Bucharest, RO



EMERALD – Monitoring Transnational Meeting - TPM 2 - August 2022 - University Politehnica Bucharest, RO

The event is organized at **the University Politehnica Bucharest**, together with the Executive team (1 representative of each institution that is involved in the consortium) + 1 representative of the Technical Team, with **the main goals**:

- to monitor the first stage of the project (IO1), to audit the direction, to take several measures if such measured are imposed due to delays from the project management plan or due to unpredicted risks caused by pandemic context
- to plan the next activities to be developed within the EMERALD project in IO2 with clear tasks allocated to the Technical Team and/ or the Communication Team.
- financial Team will provide one detailed report about all the expenses / status of the Timesheets / new regulations imposed in pandemic period and urgent measures that might be carried out from the financial point of view / financial reports if needed, etc. prior to this meeting

European Network For 3D Printing Of Biomimetic Mechatronic Systems

more to come...

European Network For 3D Printing Of Biomimetic Mechatronic Systems

EMERALD – Monitoring Transnational Meeting - TPM 3 - January 2023 - Poznan University of Technology, PL

The event will be organized at the **University of Poznan (Poland)**, together with the Executive team (1 representative of each institution that is involved in the consortium) + 1 representative of the Technical Team, with **the main goals**:

- to monitor the progress of the activities, financial aspects
- to discuss / finalize Interim Report
- to communicate changes in rules and regulations imposed by the Romanian National Agency (if it is the case) / to discuss about re-allocating budget
- to take care about all the technical activities that are required to be realized in the project. Most important discussions will be held about the preparing steps required for IO3, related to the e-virtual laboratory platform, which has to be finished until July 2023.

European Network For 3D Printing Of Biomimetic Mechatronic Systems

EMERALD – Monitoring Transnational Meeting - TPM 4 - June 2023 - BIZZCOM company, SK

The event will be organized at the **BIZZCOM company (SK)** together with the Executive team (1 representative of each institution that is involved in the consortium) + 1 representative of the Technical Team, with **the main goals:**

- to discuss about the finalizing of virtual laboratory platform that is expected to be finalized at the end of July 2023 within IO3
- to discuss about the case study reports that have to be finished until September 2023
- to monitor and discuss the status of open access book / toolkit manual / patent submission / diploma projects / academic papers that are expected to be made with the support of the medical institutions and mentors / co-mentors of the EMERALD consortium.
- aspects related to final scientific / dissemination / financial report will be discussed prior to this meeting as well, so as all planning about final delivery reports will be made in due time prior in advance (1 and half months before) for preliminary checking

European Network For 3D Printing Of Biomimetic Mechatronic Systems

Main actions of the EMERALD project

TPM	Transnational project meetings
ME	Multiplier Events
C	Intensive Programmes for higher education / Short-term joint staff training events
EMERALD - Summarizing the Calendar of the project / deadlines / milestones	

European Network For 3D Printing Of Biomimetic Mechatronic Systems

Multiplier events organized within the EMERALD project in 2022-2023

	ORGANIZING INSTITUTION	DATE	LOCAL PARTICIPANTS	FOREING PARTICIPANTS
ME 1	University Politehnica Bucharest, Romania	2 SEPTEMBER 2022	40	-
ME 2	Technical University of Cluj-Napoca, Romania	17 FEBRUARY 2023	40	8
ME 3	BIZZCOM company ,Slovakia	01 SEPTEMBER 2023	40	-

European Network For 3D Printing Of Biomimetic Mechatronic Systems



EMERALD Multiplier Event on:

Research base learning method for teaching in bio-mechatronics



Organized by the Politehnica University of Bucharest, Romania
in cooperation with the EMERALD project consortium partners



EMERALD: European network for 3D printing of biomimetic mechatronic systems
EEA & Norway Grant - Contract No. 21-COP-0019

MULTIPLIER EVENT ON RESEARCH BASE LEARNING METHOD FOR TEACHING IN BIO-MECHATRONICS

POLITEHNICA University of Bucharest, Romania

Program

Date: 02.09.2022, between 9.00-14.00, UPB Central Library, Hall 2.2

Hour	Activity
9:00	Participants registration
9:15	Event opening Prof. Nicolae Ionescu (Politehnica University of Bucharest) / Prof. Tom Savu (Politehnica University of Bucharest) – Dep TCM
9:30	EMERALD Project Presentation Assoc. Prof. Diana Băilă (Politehnica University of Bucharest)
9:45	ANPCDEFP – Radu Stoika – EEA Norway grants – aims, particularities and opportunities
10:00	EMERALD Project – Main Aims, Actions and Activities of the project Assoc. Prof. Răzvan Păcurar (Technical University of Cluj-Napoca, Romania)
10:15	University of Agder Norway – Presentation Prof. Filippo Sanfilippo
10:30	Poznan University of Technology – Presentation Prof. Filip Gorski
10:45	LEYCOM Company – Presentation (Additive manufacturing of prostheses: SLM, SLA, SLS, FRESH 3D Printing, etc)

Multiplier events

11:00	Coffee Break
11:15	Intelligent (Smart) Materials Prof. Zaharia Cătălin (Politehnica University of Bucharest)
11:45	ADMASY'S Company – Presentation NUTECHNOLOGIES Company – Presentation
12:15	BIZZCOM Company - Slovakia Director Eng. Branislav Rabara
12:30	« Ilie Murgulescu » Institute of Physical – Chemistry – Romanian Academy - Bucharest Oxide nanomaterials used for sensors CS3 Eng. Oana Cătălina Mocioiu
13:00	Round table discussions about future potential collaboration in the bio-mechatronics / 3D printing domain - Assoc. Prof. Diana Băilă (Politehnica University of Bucharest)
13:30	Final conclusions
14:00	Lunch time

EMERALD project consortium partners:



European Network For 3D Printing Of Biomimetic Mechatronic Systems

Multiplier events

ME2 - Applied research teaching methods for Higher education

Start Date : 17 Feb 2023

End Date : 17 Feb 2023

Country of Venue : Technical University of Cluj-Napoca, Romania

Participating Organizations : University Politehnica Bucharest, Technical University of Cluj-Napoca, University of Agder, Bizzcom s.r.o., Poznan University of Technology

Event Description : to present and share the results reached in intellectual output 2, related to the e-toolkit manual.

Organized free of charge ! one day ! and the participants are required to register in the preamble. Expected number of attendees is about 48 people.

The target groups: ➤ are colleagues, teaching staff, students, other people involved in Higher education in their respective organizations

Intellectual Outputs Covered : IO2 - EMERALD e-toolkit manual for digital learning in producing biomimetic mechatronic systems

The aims of ME2 are:

- research base learning for teaching methods that can be used in higher education in the EMERALD project
- presenting of overall objectives of EMERALD project / presenting of the overall approach
 - presenting of e-toolkit manual
- future activities/perspectives of EMERALD consortium in digital learning & teaching, implementing & transferring of the results

PROPOSED AGENDA

9:00 - Registration of the participants.	13:30 Presenting of e-toolkit manual for developing of new biomimetic mechatronic systems (aspects related to Bio-mechatronics)
9:30 - Welcome to the multiplier event at the Technical University of Cluj-Napoca	14:00 Presenting of a-toolkit manual for developing of new biomimetic mechatronic systems (aspects related to 3D printing and Smart materials)
10:00 Presenting on how research base learning for teaching mechatronics and 3D printing methods can be used in higher education (EMERALD project)	14:30 Conclusions, future activities of EMERALD consortium
10:30 Presenting of overall support e-courses / e-resources developed by the EMERALD consortium	14:45 Round table
11 :30 Presenting of a-toolkit manual for developing of new biomimetic mechatronic systems (aspects related to CAD/ CAE)	Q & A- EMERALD project perspectives in implementing and transferring of the results.
12:00 Presenting of e-toolkit manual for developing of new biomimetic mechatronic systems (aspects related to Computer programming)	

European Network For 3D Printing Of Biomimetic Mechatronic Systems

Multiplier events

ME3 - EMERALD personalized and project learning methods for Higher education

Start Date : 01 Sep 2023

End Date : 01 Sep 2023

Country of Venue : BIZZCOM company ,Slovakia

Participating Organizations : University Politehnica Bucharest, Technical University of Cluj-Napoca, University of Agder, Bizzcom s.r.o., Poznan University of Technology

Event Description: to present and share the results reached in intellectual output 3, e-learning virtual laboratory (e-learning platform) & and intellectual output 4 related to e-case studies

Organized free of charge ! one day ! and the participants are required to register in the preamble. **Expected number of attendees is about 40 people.**

The target groups: ➤ are colleagues, teaching staff, students, other people involved in Higher education in their respective organizations

Intellectual Outputs Covered : IO3 and IO4

The aims of ME3 are:

- personalized and project learning methods can be used for teaching in higher education using the EMERALD virtual laboratory platform
- presenting and experiencing of the virtual laboratory / AR / mixing AR applications developed by EMERALD consortium
- conclusions, future perspectives of implementing and transferring of the results, publications, dissemination, new project proposals
- future activities/perspectives of EMERALD consortium in digital learning & teaching, implementing & transferring of the results

PROPOSED AGENDA

9:00 - Registration of the participants. 9:30 - Welcome to the multiplier event at BIZZCOM company (Slovakia)	12:00 EMERALD project perspectives in implementing, disseminating and transferring of the results
10:00 Presenting on how personalized and project teaching methods can be used in teaching in higher education (using the EMERALD resources)	12:30 Round table, Q & A, final conclusions
10:30 Overall presentation about e-virtual laboratory / e-learning platform developed by the EMERALD consortium	14:00 Live experiencing of the EMERALD VR/ AR e-learning platform
11:30 Presenting of EMERALD consortium opportunities (case studies developed based on project base learning methods for people with special needs (practical using of EMERALD e-virtual laboratory / e-learning platform)	

European Network For 3D Printing Of Biomimetic Mechatronic Systems

Main actions of the EMERALD project

TPM	Transnational project meetings
ME	Multiplier Events
C	Intensive Programmes for higher education / Short-term joint staff training events
EMERALD - Summarizing the Calendar of the project / deadlines / milestones	

European Network For 3D Printing Of Biomimetic Mechatronic Systems

LTT activities

Intensive Programmes for higher education / Short-term joint staff training events

	ORGANIZING INSTITUTION	PERIOD / NUMBER OF DAYS	SENDING ORGANISATION	STUDENTS	PROFESSORS	INVITED STAFF	
C 1	University of Agder, NO	SEPTEMBER 2022 / 10 DAYS	Technical University of Cluj-Napoca	5	4	-	UiA – 5 extra participants TOTAL : 30 participants
			University Politehnica Bucharest	5	2	-	
			University of Agder	-	-	-	
			Bizzcom s.r.o.	-	-	2	
C 2	Bizzcom s.r.o., SK	MAY 2023 / 4 DAYS	Poznan University of Technology	5	2	-	Bizzcom s.r.o. – 4 extra participants TOTAL:20 participants
			Technical University of Cluj-Napoca	-	4	-	
			University Politehnica Bucharest	-	4	-	
			University of Agder	-	4	-	
C 3	University of Agder, NO	JULY 2023 / 10 DAYS	Bizzcom s.r.o.	-	-	-	UiA – 5 extra participants TOTAL : 30 participants
			Poznan University of Technology	-	4	-	
			Technical University of Cluj-Napoca	5	4	-	
			University Politehnica Bucharest	5	2	-	
			University of Agder	-	-	-	
			Bizzcom s.r.o.	-	-	2	
			Poznan University of Technology	5	2	-	

European Network For 3D Printing Of Biomimetic Mechatronic Systems

LTT activities

C1 : Intensive Programmes for higher education students – 3D printing and bio-mechatronics

Duration : 10 day(s)

Country of Venue : Norway

Total number of Participants : 30

Date: September 2022

The 1st International summer school organized by the University of Agder.

Participating Organizations : University Politehnica Bucharest, Technical University of Cluj-Napoca, University of Agder, Bizzcom s.r.o., Poznan University of Technology

The target groups: ➤ professors (from EMERALD consortium and engaged in technical activities) & students
Organized free of charge! the participants are required to REGISTER in the preamble.

Aims: Starting from the curriculum that has been defined by the EMERALD project consortium and taking into consideration that at the time of organizing this event, e-support courses are being delivered, EMERALD consortium professors will be able to exercise the usefulness of the information provided in the e-courses on the 1st edition of EMERALD International summer school, by being engaged in teaching activities and sharing the information prepared in the e-course modules (e-book) IO1 with the attending professors & students.

Courses & practical activities related to the IO1 modules

Computer Aided Design,
Computer Aided Engineering,
Computer Programming,
Virtual Reality / Augmented Reality,
Sensors and Electronics,
BioMechatronics,
3D printing and Rapid Tooling methods,
Intelligent materials

Students will be organized in teams and competitions will be launched in order to finally produce the case studies that are being required to be made for the final test (case studies will be the ones stated to be realized in the O2, adapted for people with special needs). At the end of the EMERALD International summer school, all participants will receive an invitation of joining the future activities of EMERALD consortium activities together with their professors (mentors) in the next upcoming year.

Content?

Report?

Certificates ?

European Network For 3D Printing Of Biomimetic Mechatronic Systems



European Network For 3D Printing
Of Biomimetic Mechatronic Systems

EMERALD International Summer School on:

3D printing in bio-mechatronics

Organized at the University of Agder, Norway by the EMERALD project consortium partners



EMERALD International Summer School on 3D Printing in Bio-Mechatronics – 12-23 September 2022

h	Monday 12.09.2022	Tuesday 13.09.2022	Wednesday 14.09.2022	Thursday 15.09.2022	Friday 16.09.2022	Monday 19.09.2022	Tuesday 20.09.2022	Wednesday 21.09.2022	Thursday 22.09.2022	Friday 23.09.2022	h	
10	Opening ceremony and project presentation	CAD - Lecture	CAE - Lecture	Workshop 3D Printing and & Progress report, feedbacks regarding printing process, corrections to be made	Company visit, professional visit of SME company in Kristiansand / Stavanger + visiting of the fjords / socializing activity	General progress of W1 and objectives of W2	Intelligent (smart) materials	Computer Programming case studies	Finalizing progress report, preparing final presentation	Closing and awarding ceremony, future perspectives of the EMERALD project	10	
11	Participants' presentation and program guidelines for summer school	Workshop 3D / Launching of case studies	Workshop 3D CAE & Progress report	Medical and mechanical tests, metrology of mechatronic systems		Feedback on behalf of the EMERALD experts and guidelines for W2	Sensors and electronics	VR and AR programming applications presentation, case studies	Final test, final questionnaires and feedbacks	EMERALD final consortium meeting	11	
12	Lunch & free time	Lunch & free time	Lunch & free time	Lunch & free time		Lunch & free time	Lunch & free time	Lunch & free time	Lunch & free time	Lunch & free time	Lunch & free time	12
13	Visiting of UiA laboratories and city tour of Kristiansand city	Workshop 3D CAD redesigned & Progress report	3D printing and Rapid Tooling for mechatronics	Laboratory on Mechanical test, metrology/ medical institute visit		Bio-mechatronics	Assembling and testing of mechatronic systems conceived and developed	Developing of VR/AR applications	Round table with local representatives of business sector (companies / research institutes) involved in mechatronics)	Free time, sightseeing	13	
14			Workshop 3D Printing and & Progress report	Re-designing/ re-analyzing / re-3D printing of the components		Laboratory on / bio-mechatronics			Final student presentations			14
15											15	
WEEK 1						WEEK 2						

European Network For 3D Printing Of Biomimetic Mechatronic Systems

LTT activities

C2 : Short-term joint staff training events – 3D printing and bio-mechatronics

Duration : 4 day(s)

Country of Venue : Slovakia

Total number of Participants : 20

Date: May 2023

The International summer school organized by the BIZZCOM company

Participating Organizations : University Politehnica Bucharest, Technical University of Cluj-Napoca, University of Agder, Bizzcom s.r.o., Poznan University of Technology

Activity : ➤ is focused on the use and testing the functionality of e-virtual laboratory (e-learning) platform developed by the EMERALD consortium for teaching activities related to the manufacturing of biomimetic mechatronic systems by 3D printing

The target groups: ➤ professors ➤ other people / institutions (stakeholders) involved in research activities related to the developing, manufacturing and testing of new biomimetic mechatronic systems made by 3D printing, for people with special needs

Testing the functionality of virtual laboratory platform developed within IO3 related to:
different scenarios in VR / AR / Mixed Reality applications for people with special needs

IMPORTANT FEEDBACKS

Content?

Report?

Certificates ?

European Network For 3D Printing Of Biomimetic Mechatronic Systems

LTT activities

C2 : Short-term joint staff training events – 3D printing and bio-mechatronics



European Network For 3D Printing Of Biomimetic Mechatronic Systems

LTT activities

C3 : Intensive Programmes for higher education students - 3D printing and bio-mechatronics

Duration : 10 day(s)

Country of Venue : Norway

Total number of Participants : 30

Date: July 2023

The 2nd International summer school organized by the University of Agder.

Participating Organizations : University Politehnica Bucharest, Technical University of Cluj-Napoca, University of Agder, Bizzcom s.r.o., Poznan University of Technology

The target groups: ➤ professors (from EMERALD consortium and engaged in technical activities) & students
Organized free of charge ! the participants are required to REGISTER in the preamble.

Aims: to familiarize the attendees with the personalized and project based teaching methods used in Higher education and the efficiency of these methods in using the EMERALD project resources, especially e-virtual laboratory (e-learning platform) AR / VR / mixed reality applications for getting knowledge and practical skills in developing of new biomimetic mechatronic systems by 3D printing technologies and specific applications related to the programming of biomimetic mechatronic systems AR / VR applications.

Students will be able first to understand the basic principles that are related to CAD/CAE, manufacturing, programming and testing of biomimetic systems using e-virtual laboratory (e-learning) platform.

Professors will present on a course the basics of different case study that is being prepared, with the particularities involved in the case when biomimetic mechatronic systems are required to be materialized for people with special needs, emphasizing the facilities of the virtual laboratory (e-learning platform / AR / VR applications).

In this way the easiness in using the e-learning platform of the EMERALD consortium will be checked based on the feedbacks provided by students.

Testing and experiencing the virtual laboratory platform developed within IO3 related to: different scenarios in VR / AR / Mixed Reality applications for people with special needs

IMPORTANT FEEDBACKS

Certificates ?

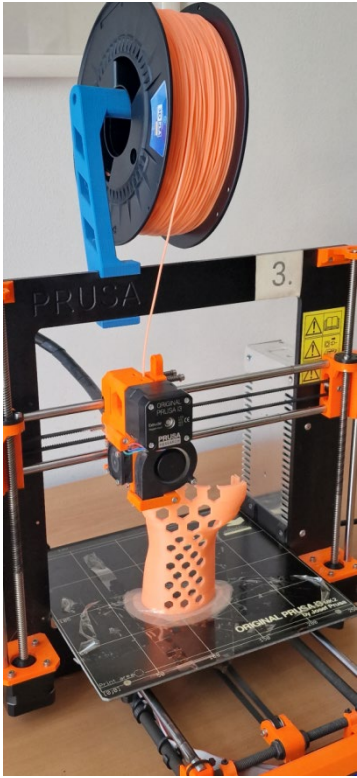
Report?

Main results reached during the EMERALD summer school organized at the University of Agder in July 2023 will be presented in September 2023 at the Multiplier event organized in Slovakia by BIZZCOM

European Network For 3D Printing Of Biomimetic Mechatronic Systems

LTT activities

C3 : Intensive Programmes for higher education students - 3D printing and bio-mechatronics



Experiencing of the Virtual platform laboratory conceived by the EMERALD consortium in bio-mechatronics / 3D printing (with AR /VR facilities)

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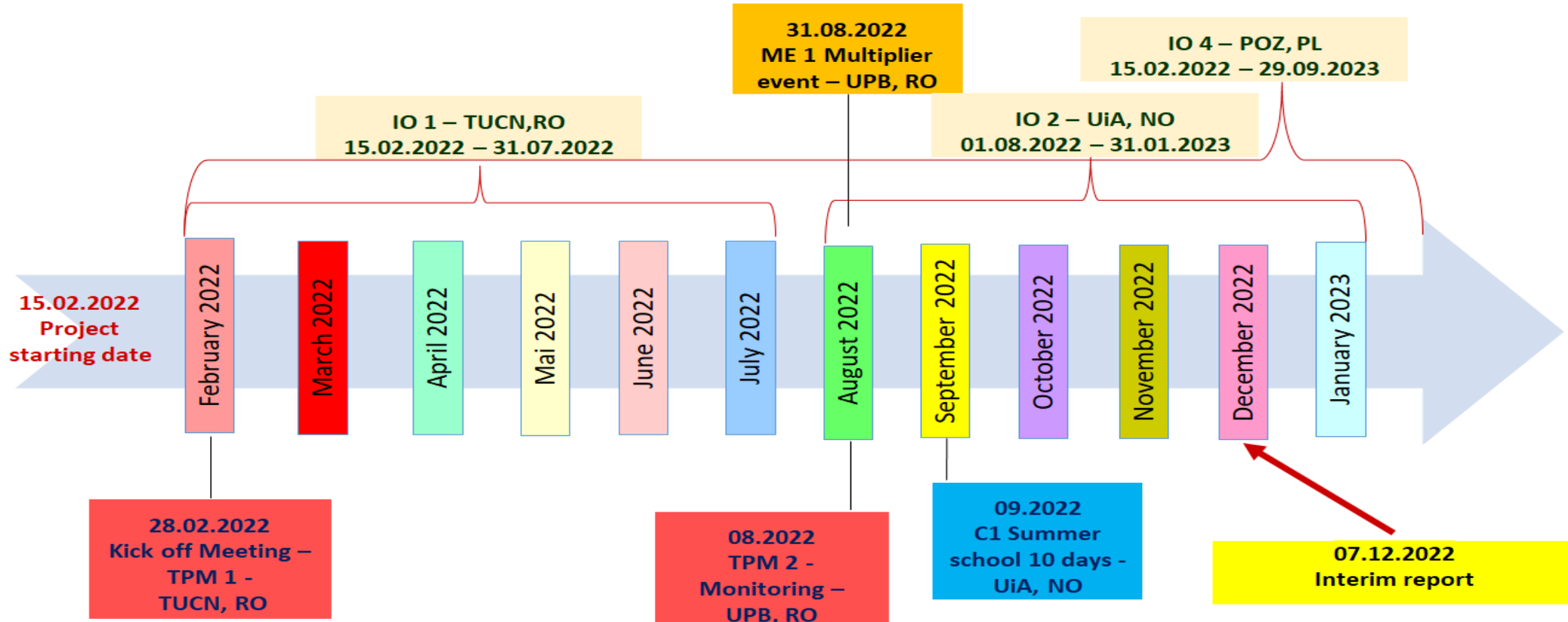
Main actions of the EMERALD project

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EMERALD - Summarizing the Calendar of the project / deadlines / milestones

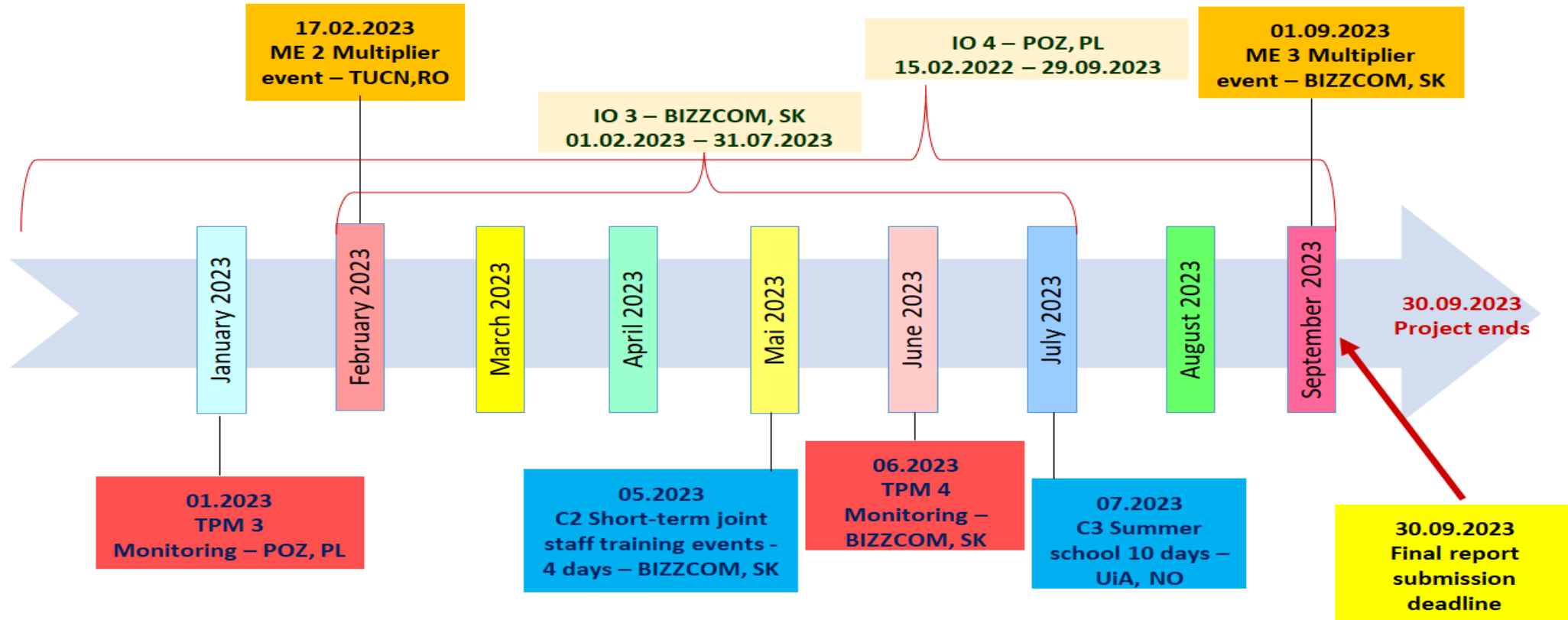
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EMERALD - Summarizing the Calendar of the project / milestones



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EMERALD - Summarizing the Calendar of the project / milestones



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EMERALD International Summer School – 2022 edition

Strong motivation for the next EMERALD International Summer school – 2022 edition (September 2022)

Interested students at EMERALD summer school will be supported by the EMERALD consortium to apply to the EMERALD International Summer School to be organized in Kristiansand (Norway) at the University of Agder (12th -23rd of September 2022) + they will have the chance to apply and work for their diploma projects in the field of 3D printing / VR/ AR / bio-mechatronic / biomimetic / medical applications with the support and under supervision of EMERALD partners consortium)!!!



European Network For 3D Printing Of Biomimetic Mechatronic Systems

EMERALD project - contact details



www.project-emerald.eu



www.project-emerald.eu

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