European network for 3D printing of biomimetic mechatronic systems

21-COP-0019
Kick-off meeting

- 28 of February – 1st of March 2022

This results was realised with the EEA Financial Mechanism 2014-2021 financial support. Its content (text, photos, videos) does not reflect the official opinion of the Programme Operator, the National Contact Point and the Financial Mechanism Office. Responsibility for the information and views expressed therein lies entirely with the author(s)

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EUROPEAN NETWORK FOR 3D PRINTING OF BIOMIMETIC MECHATRONIC SYSTEMS - EMERALD

The Education, Scholarships, Apprenticeships and Youth Entrepreneurship Programme – EEA Grants 2014-2021
Project No:
21-COP-0019
Project Title:
European network for 3D printing of biomimetic mechatronic systems

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EUROPEAN NETWORK FOR 3D PRINTING OF BIOMIMETIC MECHATRONIC SYSTEMS - EMERALD

Main objectives of the project

- European network for 3D printing of biomimetic mechatronic systems
- to boost the scientific excellence in teaching in the field of conceiving and realizing of new types of biomimetic mechatronic systems for people with special needs
- Developing of new applications in VR / AR / mixed reality for providing feedbacks related to the testing of the new biomimetic mechatronic systems conceived
- 8 course modules will be realized for providing the necessary knowledge for materializing of the biomimetic mechatronic systems
- 1 virtual laboratory platform conceived by the experts of the EMERALD consortium, where students and professors will have the chance to experience the use of biomimetic mechatronic systems in virtual mode
- EMERALD e-learning platform, case studies will be launched by the EMERALD consortium for realizing new types of biomimetic mechatronic systems for people with special needs

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EUROPEAN NETWORK FOR 3D PRINTING OF BIOMIMETIC MECHATRONIC SYSTEMS - EMERALD

9:00 – 10:15

1. Information/Bilateral contractualisation

1.1 Information from National Agency

1.2 Contracts and annexes

- UTCN will be given a contact person in charge of the project follow-up
- Possible follow-up modalities:
  - Follow-up visits
  - Virtual classrooms
  - Phone calls

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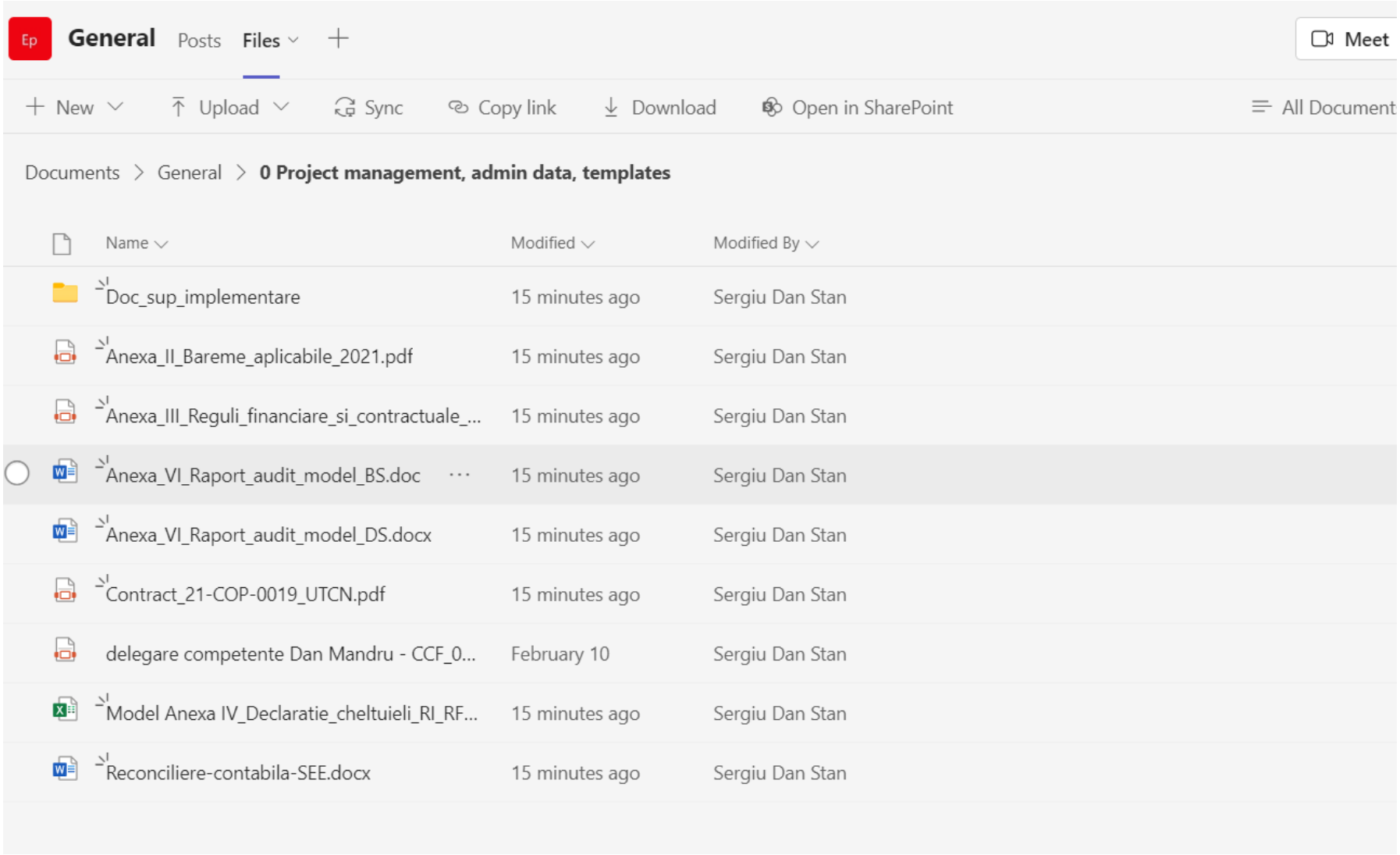
1. Information/Bilateral contractualisation

“By signing the Agreement, the beneficiaries accept the grant and agree to implement the Project, acting on their own responsibility. “



1. Information/Bilateral contractualisation

1.2 Contracts and annexes

3.1 Finanțarea va fi în **sumă maximă de 198810 EUR**, respectiv 983373.90LEI[2]. 85% din acest buget (168988.50 Euro, respectiv 835867.82LEI) reprezintă grant SEE iar 15 % (adica 29821.50 Euro, respectiv 147506.08 LEI) reprezintă cofinanțarea din bugetul național.

Capitole bugetare	**Suma alocată (EURO)**
Managementul şi implementarea proiectului	29250
Mobilitati transnaţionale de scurtă durată	80420
Produse intelectuale	75540
Evenimente de multiplicare	13600
Sprijin pentru nevoi speciale	0
Costuri excepţionale	0
TOTAL	**198810**

Reminder about the grant (maximum amount)

OVERALL BUDGET

						TPM							
					PMI	student	staff	stte	hei	invited staff	IO	ME	total
1	Technical University of Cluj-Napoca				9750	8550	2988	2416	10680	0	17760	5600	57744
2	University POLITEHNICA of Bucharest				4875	8550	3368	2796	5340	0	10730	4000	39659
3	University of Agder				4875	0	4744	2796	0	0	28920	0	41335
4	Bizzcom s.r.o.				4875	0	3178	0	0	5340	9250	4000	26643
5	Poznan University of Technology				4875	8550	3368	2416	5340	0	8880	0	33429
					29250	25650	17646	10424	21360	5340	75540	13600	198810

Expenditure	Grant (Euro)
1, Project management and implementation	29250
2. Short term transnational mobility activities of individua	80420
3 Intelectual outputs	75540
4, Multiplier events	13600
5. Special needs	0
6, Exceptional costs	0
Total requested from EEA Grants 2014-2021	198810

EMERALD budget

1. Project management and implementation

Name of the institution (including Project Promoter)	Grant (Euro)
Technical University of Cluj-Napoca	9750
University POLITEHNICA of Bucharest	4875
University of Agder	4875
Bizzcom s.r.o.	4875
Poznan University of Technology	4875
Total	29250

2. Short term transnational mobility activities of individuals

Student mobility

Technical University of Cluj-Napoca	5800	2750	8550
Poznan University of Technology	5800	2750	8550
University POLITEHNICA of Bucharest	5800	2750	8550
Total	17400	8250	25650

Staff mobility (including transnational project meetings)

TPM

University POLITEHNICA of Bucharest	1908	1460	3368
University of Agder	2544	2200	4744
Bizzcom s.r.o.	1908	1270	3178
Poznan University of Technology	1908	1460	3368
Technical University of Cluj-Napoca	1908	1080	2988
Total	10176	7470	17646

STTE

University POLITEHNICA of Bucharest	1696	1100	2796
University of Agder	1696	1100	2796
Poznan University of Technology	1696	720	2416
Technical University of Cluj-Napoca	1696	720	2416
Total	6784	3640	10424

Hei invited staff

University POLITEHNICA of Bucharest	4240	1100	5340
Poznan University of Technology	4240	1100	5340
Technical University of Cluj-Napoca	8480	2200	10680
Total	16960	4400	21360

Invited_Staff_IP

Bizzcom s.r.o.	4240	1100	5340
Total	4240	1100	5340

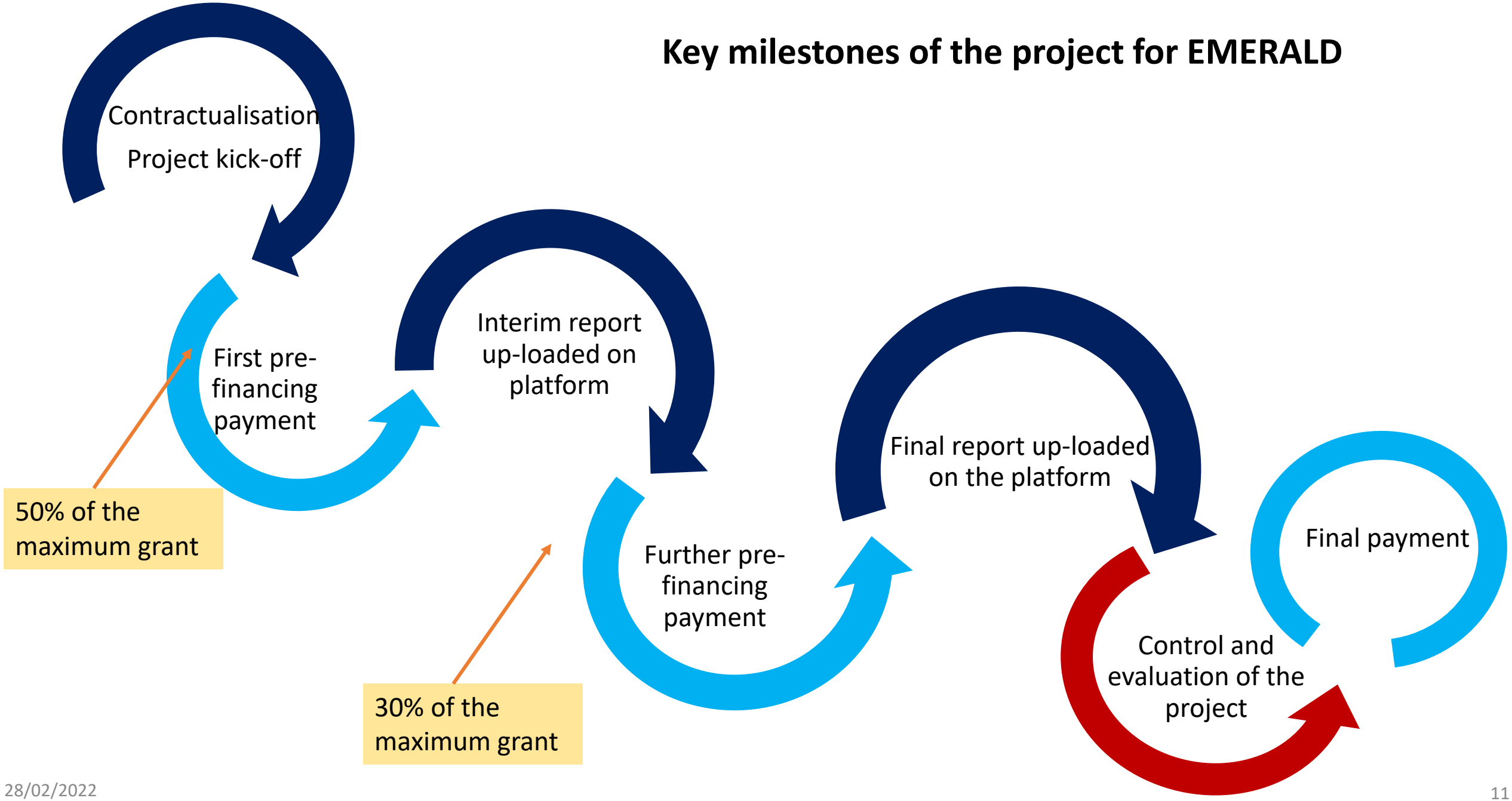
3. Intelectual outputs

	IO1			IO2			IO3			IO4				
	Number days	Grant per day (Euro)	Grant requested (Euro)	Number days	Grant per day (Euro)	Grant requested (Euro)	Number days	Grant per day (Euro)	Grant requested (Euro)	Number days	Grant per day (Euro)	Grant requested (Euro)		Total Euro
Technical University of Cluj-Napoca	60	74	4440,00	60	74	4440,00	60	74	4440,00	60	74	4440,00		17760
University POLITEHNICA of Bucharest	40	74	2960,00	35	74	2590,00	35	74	2590,00	35	74	2590,00		10730
University of Agder	30	241	7230,00	30	241	7230,00	30	241	7230,00	30	241	7230,00		28920
Bizzcom s.r.o.	20	74	1480,00	25	74	1850,00	60	74	4440,00	20	74	1480,00		9250
Poznan University of Technology	30	74	2220,00	30	74	2220,00	25	74	1850,00	35	74	2590,00		8880
													Total	75540,00

4. Multiplier events

University POLITEHNICA of Bucharest	4000
Poznan University of Technology	5600
Bizzcom s.r.o.	4000
Total	13600

Key milestones of the project for EMERALD



5 budget lines with unit costs

1. Project management and implementation
2. Transnational project meetings
3. Intellectual outputs
4. Multiplier events
5. Learning, teaching, training activities

NB: 20% flexibility between the lines except for line 1 which can not be increased

unit costs: fixed amount of money allocated for an eligible activity carried out regardless of the actual amount spent, subject to supporting documents.
See annex III – Financial and contractual rules

Only unit cost in our project.
There are exceptional costs (real costs) in our project (10K EUR).
No subcontracting of tasks possible in our project (not funded).

1. Project management and implementation

The triggering event that conditions the entitlement to the grant is that the beneficiary implements the project activities and produces the project outputs to be covered from this budget category as applied for in the grant application and as approved by the National Agency.

Supporting documents:
Proof of activities undertaken and outputs produced will be provided in the form of a description of these activities and outputs in the final report. In addition, outputs produced must be uploaded by the coordinator in the Erasmus+ Project Results Platform and/or, depending on their nature, available for checks and audits at the premises of the beneficiaries.

Reporting:
On behalf of the Project as a whole, the coordinator must report on the final distribution of funds and on undertaken activities and results.

2. Transnational project meetings

= meetings for project coordination (kick-off, interim evaluation, writing of the reports…)
(Fixed amount of money to contribute to travel and subsistence expenses)

The triggering event that conditions the entitlement to the grant is that the participant has actually participated in the transnational project meeting.

Supporting documents:

- Travel: Proof of attendance of the activity in the form of an **attendance list or individual attendance certificates** signed by the receiving organisation;
- Proof of attendance of the transnational project meeting in the form of a **participants list** signed by the participants and the receiving organisation;
- Detailed agenda and any documents used or distributed at the transnational project meeting.

2. Transnational project meetings

Reporting:
The coordinator must report on the venue of the meeting, the date and the number of participants.

In all cases, the beneficiaries must be able to demonstrate a formal link with the persons participating in transnational project meetings, whether they are involved in the Project as staff (whether on a professional or voluntary basis) or as learners of the beneficiary organisations.

3. Intellectual outputs

To calculate the grant amount, the category of staff applicable does not relate to the professional profile of the person, but to the function performed by the person in relation to the development of the intellectual output.

The triggering event that conditions the entitlement to the grant is that the intellectual output has been produced and that it is of an acceptable quality level, as determined by the evaluation of the National Agency.

Supporting documents:

- proof of the intellectual output produced, which must be uploaded in the Erasmus+ Project Results Platform and/or, depending on its nature, available for checks and audits at the premises of the beneficiaries;
- proof of the staff time invested in the production of the intellectual output in the form of a **time sheet per person**, identifying the name of the person, the category of staff in terms of the 4 categories specified in Annex IV, the dates and the total number of days of work of the person for the production of the intellectual output.

3. Intellectual outputs

Supporting documents (continued):

- **proof of the nature of the relationship between the person and the beneficiary concerned** (such as type of employment contract, voluntary work, SME ownership, etc.), as registered in the official records of the beneficiary. In all cases, **the beneficiaries must be able to demonstrate the formal link with the person concerned, whether he/she is involved in the Project on a professional or voluntary basis**. Persons working for a beneficiary on the basis of service contract (e.g. translators, web designer etc.) are not considered as staff of the organisation concerned. Their working time can therefore not be claimed under "intellectual outputs" but may be eligible under "exceptional costs" …/…

→ **Send to the coordinator an official document stating the formal link with your organization by the end of March 2022.**

→ **For any new people involved in the project, send it with the first timesheet you will provide for them.**

3. Intellectual outputs

Reporting:

On behalf of the Project as a whole, the coordinator must report on the activities undertaken and results produced. The coordinator must include information on the start and end date and on the number of days of work per category of staff for each of the beneficiaries cooperating directly on the development of intellectual outputs.

We must be able to justify finalized deliverables (reports and results on E+PR platform) for our expenses to be eligible.

4. Multiplier events

The grant amount is calculated by multiplying the number of participants from organisations other than the beneficiary, the associated partners hosting a multiplier event and other project partner organisations.

The triggering event that conditions the entitlement to the grant is that the multiplier event has taken place and that it is of an acceptable quality level, as determined by the evaluation of the National Agency.

Once the project is finished !

Supporting documents:

- Proof of attendance of the multiplier event in the form of a participants list signed by the participants and the receiving organisation;
- Detailed agenda and any documents used or distributed at the multiplier event.

4. Multiplier events

Reporting:

- On behalf of the Project as a whole, the coordinator must report on
  - ✓ the description of the multiplier event,
  - ✓ the intellectual outputs covered,
  - ✓ the leading and participating organizations,
  - ✓ the venue of the meeting
  - ✓ the numbers of local and international participants

- **In the case that the beneficiaries do not develop the intellectual outputs applied for and approved by the National Agency, the related Multiplier events will not be considered eligible for grant support either.**

- **If the National Agency awarded support for the development of several intellectual outputs but only some of them are ultimately realized, the National Agency must determine to which extent each of the related Multiplier events is eligible for grant support.**

5. Learning, teaching and training activities

The grant amount = unit contribution towards the travel, individual support and linguistic support.

The beneficiaries must be able to demonstrate the formal link with the persons participating in Transnational training, teaching or learning activities, whether they are involved in the Project as staff (either on a professional or a voluntary basis) or as learners.

Supporting documents:

Proof of attendance of the activity in the form of an attendance list or individual attendance certificates signed by the receiving organisation;

Reporting:

The coordinator must report on the venue of all learning, teaching and training activities, the date and the number of participants.

2. Project management:

2.1 Eligibility of the staff members involved in the project (hiring issues)

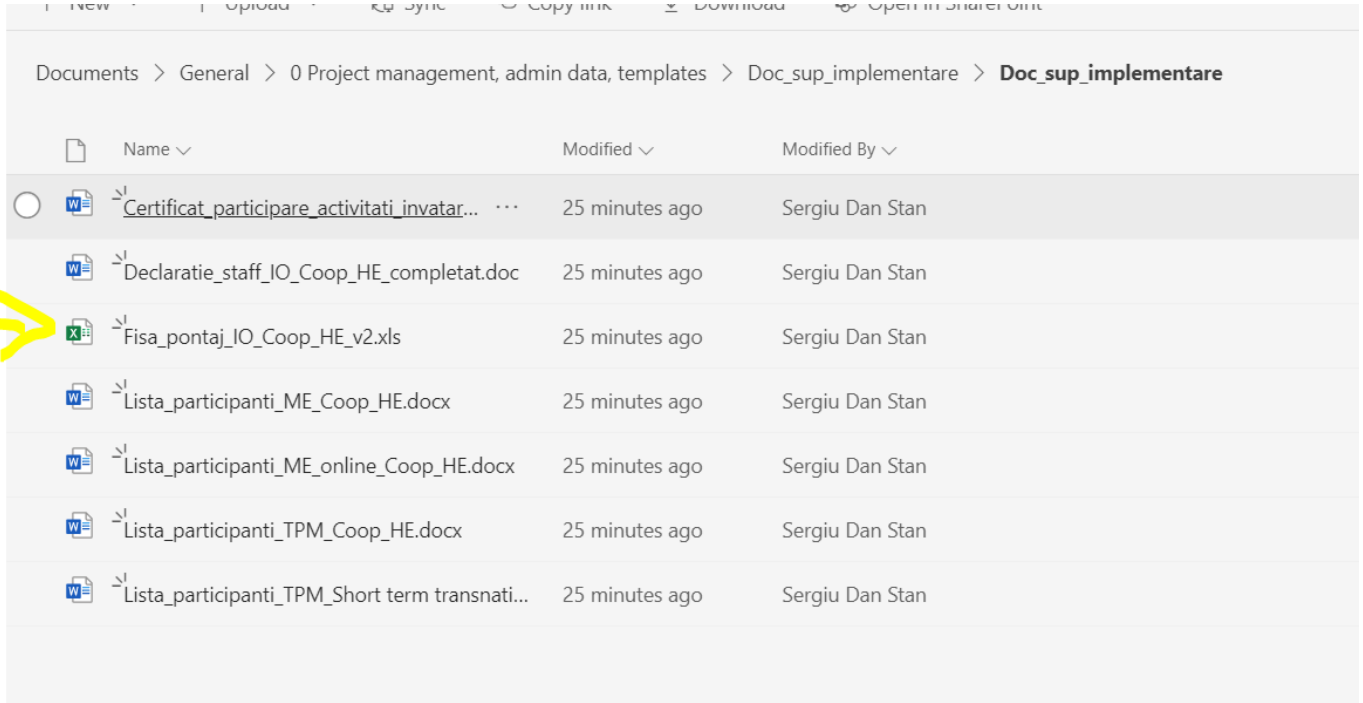
Which people are going to be involved in the project?

UTCN	Position in university	Position in project
…	…	…
…		

2. Project management:
2.2 Collection of activity reporting by the coordinator: organisation and calendar (timesheets)

Timesheet excel template

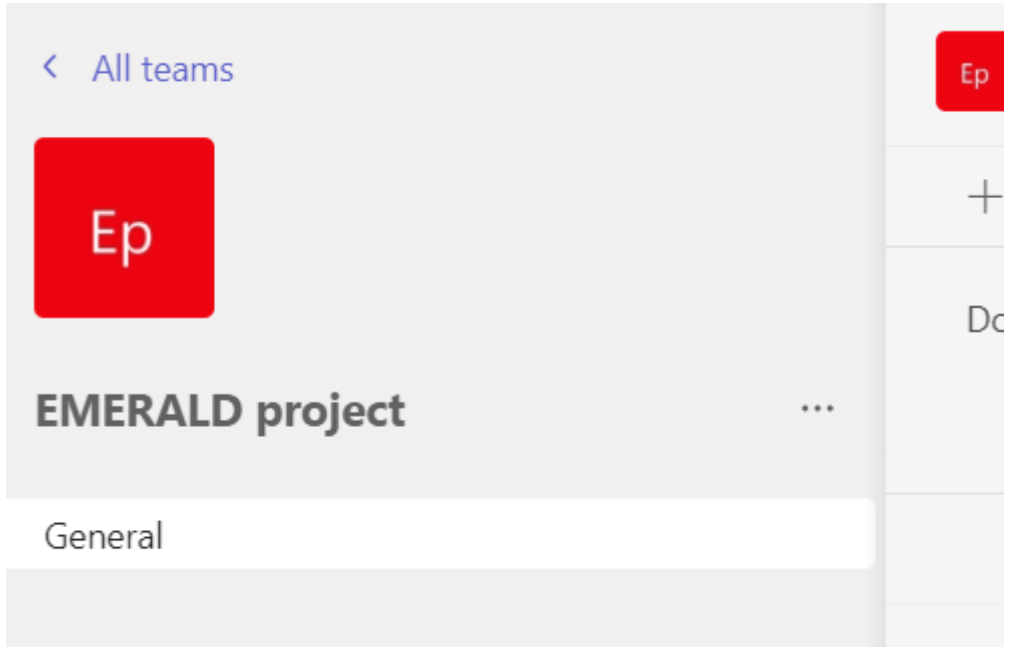
How to fill in timesheet



- Timesheets must be completed and signed monthly.
- Timesheets to be sent to UTCN every two months

2.3 Tools (Dropbox, Whatsapp, Skype)

Teams/SharePoint dedicated website



Whatsapp, Skype

An important attention will be allocated to this aspect, by all the partners. The communication and a good cooperation among this partnership, will ensure the expected results.

The Whatsapp group utility is to make sure of the involvement of the key persons and we can obtain the answers in a prompt way in order to realize the project activities. The Skype discussions will have the following objectives and frequency:

- a monthly online meeting, during which we'll monitor the implementation of the project
- 5 meetings to organize the 4 Transnational meetings
- 2 online meetings to organize the LTT

2.4. Quick overview of the EMERALD project activities and expected results

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

Transnational Project Meetings

	MEETING LOCATION	SENDING ORGANISATION	PARTICIPANTS
TPM 1	Cluj-Napoca, RO	University Politehnica Bucharest	2
		Technical University of Cluj-Napoca	2
		University of Agder	2
		Bizzcom s.r.o.	2
		Poznan University of Technology	2
TPM 2	Bucharest, RO	University Politehnica Bucharest	2
		Technical University of Cluj-Napoca	2
		University of Agder	2
		Bizzcom s.r.o.	2
		Poznan University of Technology	2
TPM 3	Poznan, PL	University Politehnica Bucharest	2
		Technical University of Cluj-Napoca	2
		University of Agder	2
		Bizzcom s.r.o.	2
		Poznan University of Technology	2
TPM 4	Bucany, SK	University Politehnica Bucharest	2
		Technical University of Cluj-Napoca	2
		University of Agder	2
		Bizzcom s.r.o.	2
		Poznan University of Technology	2

Transnational Project Meetings

Kick off meeting –TPM 1
February 2022
Technical University of Cluj-Napoca, RO

The event will be **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.

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

The event will be 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

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.

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

Role of the leaders of intellectual outputs

IO1	EMERALD e-book for developing of biomimetic mechatronic systems	TUCN
IO2	EMERALD e-toolkit manual for digital learning in producing biomimetic mechatronic systems	*University of Agder*
IO3	EMERALD e-learning VR / AR platform for programming and using biomimetic mechatronic systems	*Bizzcom*
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	*Poznan University of Technology*

Quick overview of the Intellectual outputs

Intellectual Output: 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

Intellectual Output: 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

Intellectual Output: : I03 - EMERALD e-Jearning VR / AR platform for programming and using biomimetic mechatronic systems

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

Responsible: Bizzcom company

Intellectual Output: : I04 - EMERALD a-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

Intellectual outputs

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.**

Languages : English

Open access on the platform?

Content?

Template?

Report?

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

Intellectual outputs

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 30 printing**.
➤ to provide **the other preliminary and post processing steps that are required to be followed in terms of CAD modeling**
➤ d**iploma project themes**

Open access on the platform?

Content?

Template?

Report?

	RESPONSIBLES
Conceiving the concepts of biomimetic mechatronic systems / bio-mechatronic domain	**UiA**
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**
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**
Desciption of assembling and programming of the systems	**UiA**
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**

Starting: **01.08.2022**

Deadline: **31.01.2023**

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.

Intellectual outputs

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**

Open access on the platform?

Content?

Report?

	RESPONSIBLES
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**
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**
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.

Intellectual outputs

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 30 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) .

Intellectual outputs

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

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 he field of bio-mechatronics /30 printing domains) to scale up the solutions to build one active an representative network for 30 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 30 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.

Intellectual outputs

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

ARMIN

ARM NEUROPROSTHESIS

EQUIPED WITH ARTIFICIAL SKIN AND SENSORIAL FEEDBACK

ARM NEUROPROSTHESIS EQUIPED WITH ARTIFICIAL SKIN AND SENSORIAL FEEDBACK - ARMIN

Partners: UPB, National Institute of Microtechnolgy, 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 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.

Iceland Liechtenstein Norway grants

Working together for a green, competitive and inclusive Europe

EUROPEAN NETWORK FOR 3D PRINTING OF BIOMIMETIC MECHATRONIC SYSTEMS - EMERALD

MULTIPLIER EVENTS

	ORGANIZING INSTITUTION	DATE	LOCAL PARTICIPANTS	FOREING PARTICIPANTS
ME 1	University Politehnica Bucharest, Romania	31 AUGUST 2022	40	-
ME 2	Technical University of Cluj-Napoca, Romania	17 FEBRUARY 2023	40	8
ME 3	BIZZCOM company ,Slovakia	01 SEPTEMBER 2023	40	-

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TECHNICAL UNIVERSITY OF CLUJ-NAPOCA ROMANIA

UiA University of Agder

bizzcom

MULTIPLIER EVENTS

ME 1 - EMERALD research base learning method for teaching

Start Date : 31 Aug 2022 End Date : 31 Aug 2022

Country of Venue : University Politehnica Bucharest, Romania

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

Event Description : 1st Multiplier event EMERALD project is the event organized in order to share the 1st intellectual result of a project with a larger audience. O**rganized 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: ➤**colleagues** involved in teaching Computer Aided Design, Computer Aided Engineering, Computer Programming, Virtual Reality / Augmented Reality, Sensors and Electronics, Bio-Mechatronics, 30 printing and Rapid Tooling, Intelligent (smart) materials

➤ **teaching staff, students , other partners, other people involved in in Higher education** teaching in their respective organizations, that are interested about developing, producing and testing of biomimetic mechatronic systems for people with special needs.

Intellectual Outputs Covered : I01 - EMERALD e-book for developing of biomimetic mechatronic systems

The aims of ME1 are:

-To present the project in its conception, research approach, technological outputs and e-book (the results of I01)

-To share the technological tools developed on the level of the EMERALD consortium.

PROPOSED AGENDA	
9:00 - Registration of the participants.	12:00 - Interactive feedback: a short survey to collect first impressions and reactions.
9:30 - EMERALD coordinator's welcome / Introduction to the activities.	13:00 - Presentation of 1st Intellectual Output: I01 - EMERALD e-book for developing of biomimetic mechatronic systems
10:00 - Presentation of EMERALD Consortium	14:30 - Interactive feedback: a quiz to collect first impressions and reactions on I01. Q&A time.
10:30 - Presentation of EMERALD project: a round table on WHAT WE MEANT; WHAT WE HAVE ACHIEVED; WHAT WE HAVE LEARNED;	

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 .
O**rganized 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 : I02 - 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. 9:30 - Welcome to the multiplier event at the Technical University of Cluj-Napoca	13:30 Presenting of e-toolkit manual for developing of new biomimetic mechatronic systems (aspects related to Bio-mechatronics)
10:00 Presenting on how research base learning for teaching mechatronics and 3D printing methods can be used in higher education (EMERALD project)	14:00 Presenting of a-toolkit manual for developing of new biomimetic mechatronic systems (aspects related to 3D printing and Smart materials)
10:30 Presenting of overall support e-courses / e-resources developed by the EMERALD consortium	14:30 Conclusions, future activities of EMERALD consortium
11 :30 Presenting of a-toolkit manual for developing of new biomimetic mechatronic systems (aspects related to CAD/ CAE)	14:45 Round table 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)	

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 C/uj-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

O**rganized 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 : I03 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 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 I 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)	

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	
			Poznan University of Technology	5	2	-	
C 2	Bizzcom s.r.o., SK	MAY 2023 / 4 DAYS	Technical University of Cluj-Napoca	-	4	-	Bizzcom s.r.o. – 4 extra participants TOTAL:20 participants
			University Politehnica Bucharest	-	4	-	
			University of Agder	-	4	-	
			Bizzcom s.r.o.	-	-	-	
			Poznan University of Technology	-	4	-	
C 3	University of Agder, NO	JULY 2023 / 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	
			Poznan University of Technology	5	2	-	

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-boock) 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 02, 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 ?

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 ?

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 a-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

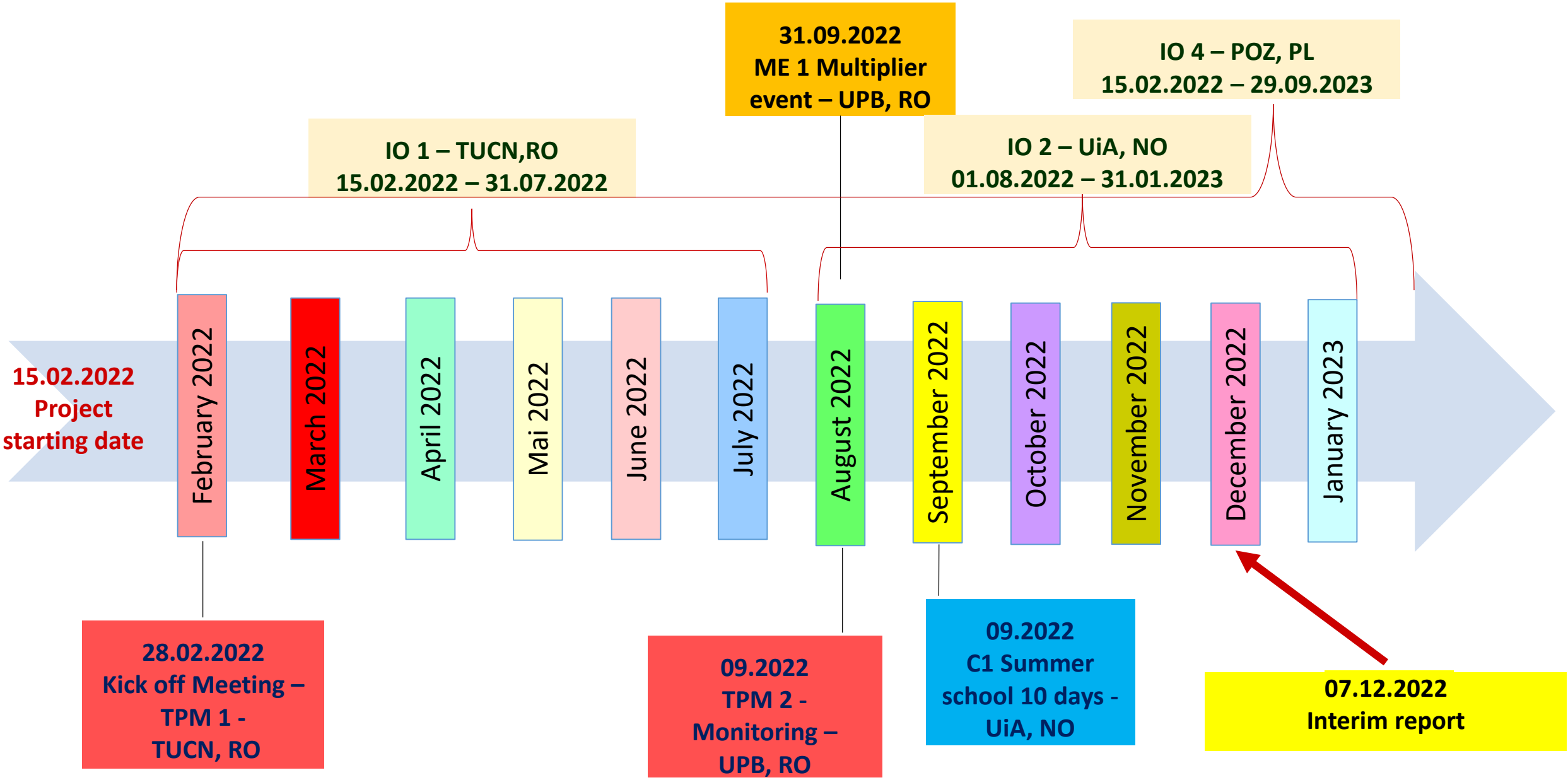
IMPORTANT FEEDBACKS

Certificates ?

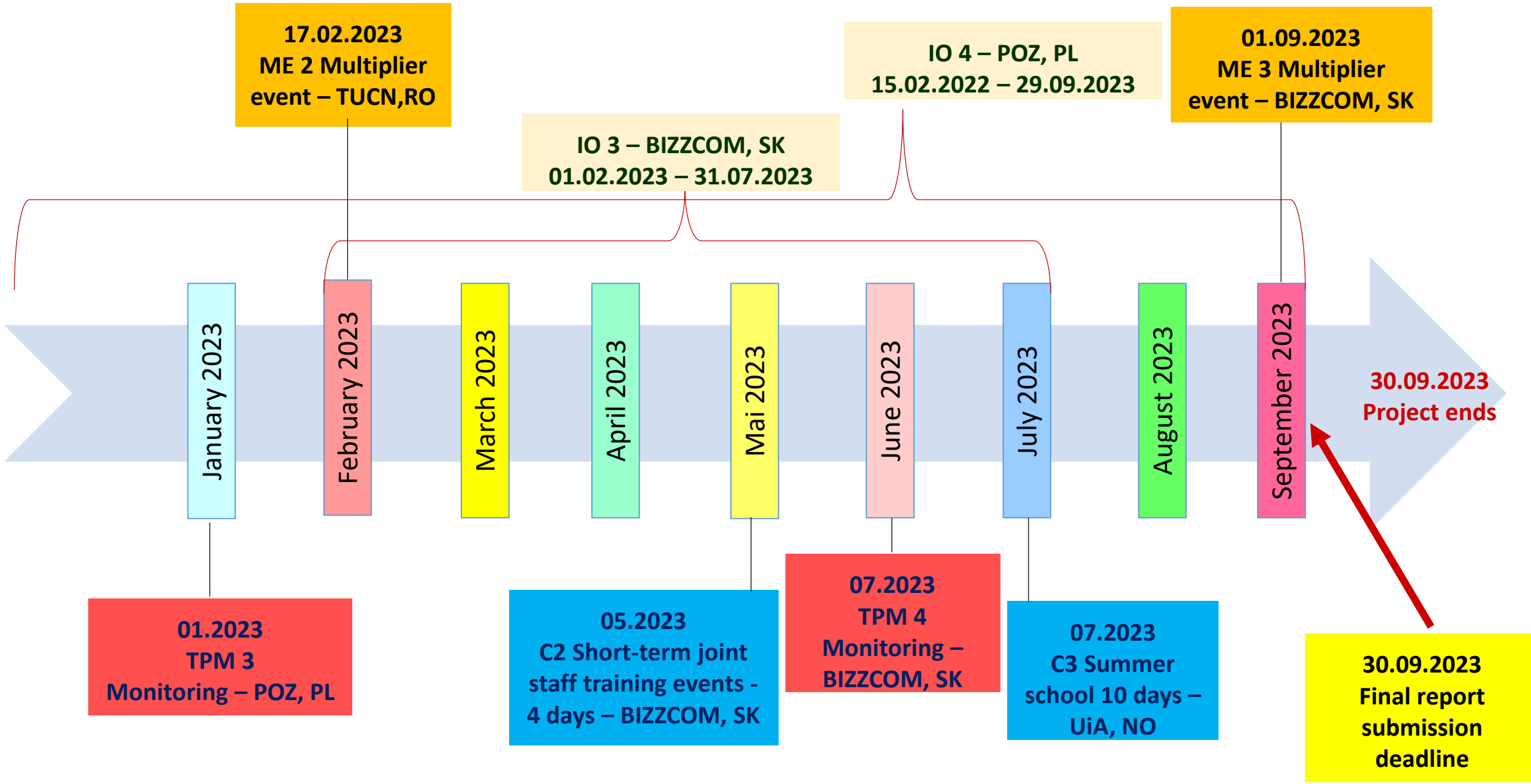
Report?

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

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



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



2.5. Validation of the distribution of tasks –
Each partner will present the plan for each activity they have ownership

IO1	EMERALD e-book for developing of biomimetic mechatronic systems	TUCN
IO2	EMERALD e-toolkit manual for digital learning in producing biomimetic mechatronic systems	*University of Agder*
IO3	EMERALD e-learning VR / AR platform for programming and using biomimetic mechatronic systems	*Bizzcom*
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	*Poznan University of Technology*

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 (Razvan Pacurar & Sergiu Dan Stan)

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 & TUCN
2. Computer Aided Engineering (CAE)	TUCN
3. Computer Programming	UiA
4. Virtual Reality / Augmented Reality	UiA & BIZZCOM
5. Sensors and Electronics	UPB
6. Bio-Mechatronics	UiA & TUCN
7. 3D printing and Rapid Tooling methods	PUT & 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**.

2.5. Validation of the distribution of tasks –
Each partner will present the plan for each activity they have ownership – IO2 – IO4

2.6. Other important aspects to be considered:

1. Communication in our institutions / How to involve more colleagues in the project
2. Evaluation / monitoring of the project
3. Disseminating plan
4. Implementation
5. Advertising (web page / logo / flyers / newspapers / press release / etc.

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EUROPEAN NETWORK FOR 3D PRINTING OF BIOMIMETIC MECHATRONIC SYSTEMS - EMERALD

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