

EMERALD International Summer School 2022 edition – brief overview

Assoc. Prof.dr.eng. Razvan Pacurar

Department of Manufacturing Engineering,
Faculty of Industrial Engineering, Robotics & Production
Management, Technical University of Cluj-Napoca, Romania





EMERALD International Summer School on:

3D printing in bio-mechatronics



12-23 SEPTEMBER 2022

WHO can apply
Bachelor students (BSc)
Master students (MSc)
PhD students

SPECIALIZATIONS:
Manufacturing Engineering
Bio-Mechatronics & Robotics
Mechanical & Bio-Mechatronics Engineering
Computer Science & Automatics
Science of Materials

www.project-emerald.eu
Registration until 9th of September 2022

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

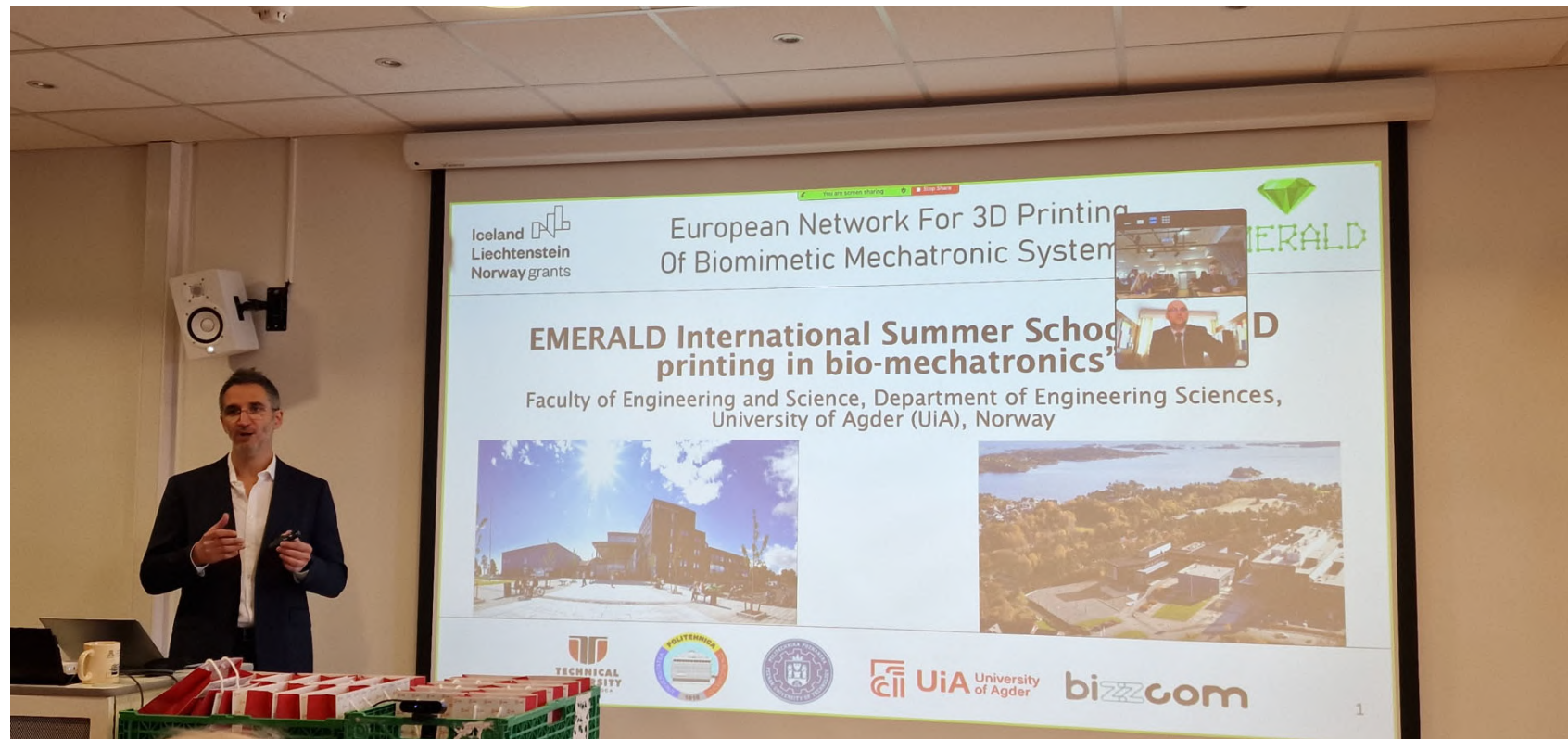


EMERALD International Summer School on 3D Printing in Bio-mechatronics – 12-23 September 2022

	Monday 12.09.2022	Tuesday 13.09.2022	Wednesday 14.09.2022	Thursday 15.09.2022	Friday 16.09.2022	Saturday 17.09.2022	Monday 19.09.2022	Tuesday 20.09.2022	Wednesday 21.09.2022	Thursday 22.09.2022	Friday 23.09.2022	
10	Opening ceremony and project presentation	CAD - Lecture	CAE - Lecture	3D printing and Rapid Tooling for mechatronics	Applications of 3D printing in pre- and inter-operative surgery	Progress report (preparing of the interim report for Monday - working on smaller groups)	General progress of W1 and objectives of W2	Intelligent (smart) materials	Metrology of mechatronic systems	Finalizing progress report, preparing final presentation	Presentations made by students for companies involved in the summer school - evaluation and feedback on behalf of the companies, defining of common ideas of future diploma projects	10
11	Participants' presentation and program guidelines for summer school	Workshop 3D / Launching of case studies	Workshop 3D CAE	Workshop 3D Printing	Enterprise dynamics (workshop)		Students' presentation (interim report + scientific presentations)					Admittance vs impedance control
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	Lunch & free time	12
13	Introduction to Biomechatronics	Workshop 3D CAD	VR and AR programming applications presentation, case studies	Actuators: theory	Presentation on behalf of Leycom company and Admasys companies from Romania	Preparing of scientific presentations for Monday (working in smaller groups)	Self-study of documentation (robotic arm) + interaction with student assistants	Admittance vs impedance control (programming)	Assembly and testing control	Final student presentations, live demonstrations, test corrections	Closing and awarding ceremony, future perspectives of the EMERALD project	13
14	Visiting of MIL laboratories	Sensors: theory	Developing of VR/AR applications	Actuators: programming (robotic arm)	Presentation on behalf of OMNI 3D company from Poland		Bio-mechatronics: programming					Finalizing work on assembly, preparing final presentation
15	Visiting of i4Helse laboratories	Sensors: programming (robotic arm)		Progress report and summary	Presentation on behalf of Blatchford company in Norway	Boat trip in Kristiansand region, visiting of fiords	Programming case studies			Free time, sightseeing	15	
WEEK 1						WEEK 2						



Opening ceremony and project presentation



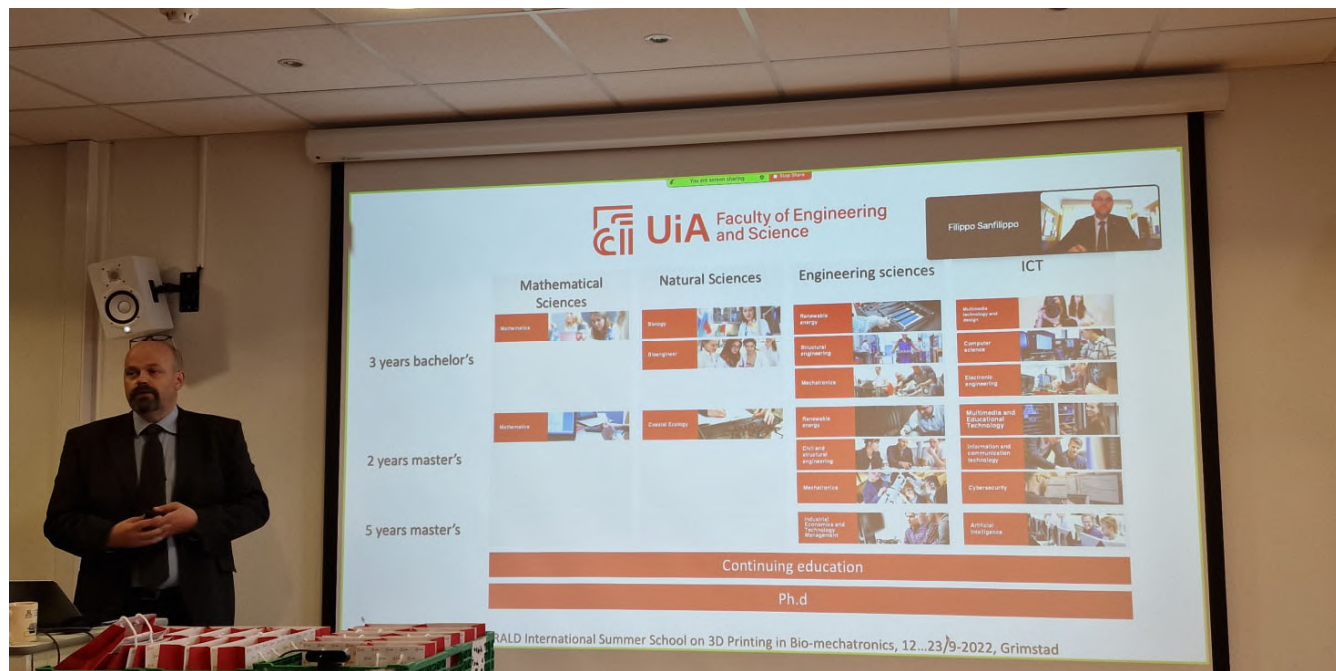
Welcoming speech of Prof. Filippo Sanfilippo – University of Agder (Norway)

Opening ceremony and project presentation



Welcoming words addressed by the Dean of the Faculty of Engineering and Science
(University of Agder, Norway) Prof.dr.eng Michael Rygaard Hansen

Opening ceremony and project presentation



Welcoming words addressed by the Dean of the Faculty of Engineering and Science
(University of Agder, Norway) Prof.dr.eng Michael Rygaard Hansen

European Network For 3D Printing Of Biomimetic Mechatronic Systems



Opening ceremony and project presentation



Remotely (online) with the EMERALD summer school participants– Mr. Romanian Ambassador in Norway, Mr. Cristian Bădescu



Opening ceremony and project presentation



**Aims, actions and activities of the project – presented by Associate prof. dr.eng. Răzvan Păcurar (TUCN -Romania)
– director of the EMERALD project**

European Network For 3D Printing Of Biomimetic Mechatronic Systems



Opening ceremony and project presentation



Official photo with the EMERALD consortium at the opening ceremony of the EMERALD International summer school



Participants' presentation



University of Agder (Norway)

Participants' presentation



Technical University of Cluj-Napoca (Romania) – leading partner of the EMERALD project



Participants' presentation



University Politehnica of Bucharest (Romania)



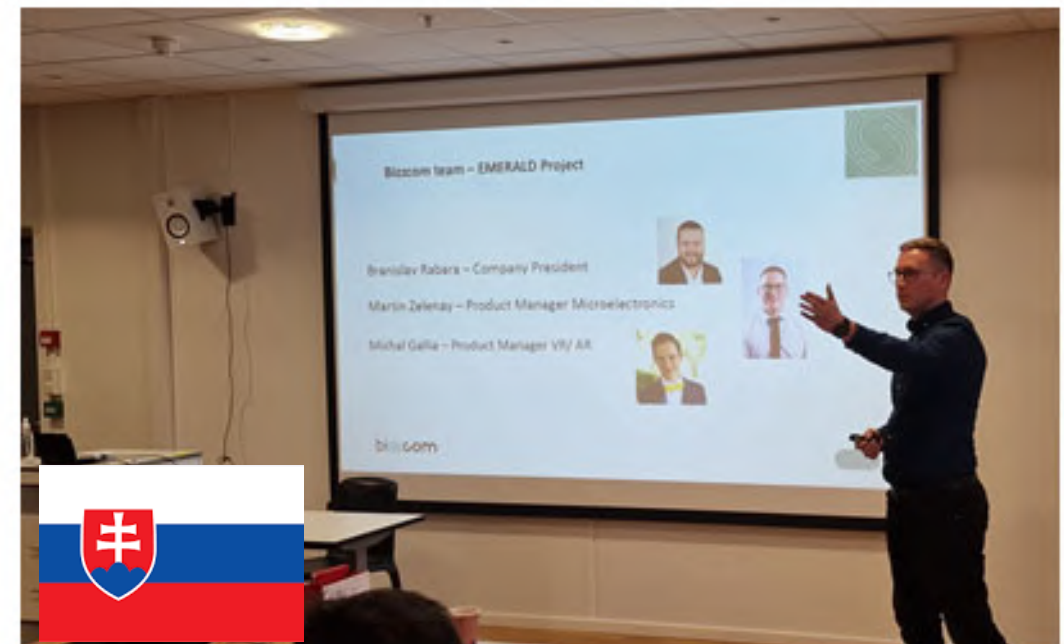
Participants' presentation



Poznan University of Technology (Poland)



Participants' presentation



BIZZCOM s.r.o. company (Slovakia)

Participants' presentation



EMERALD International summer school – unique of life experience

Participants' presentation



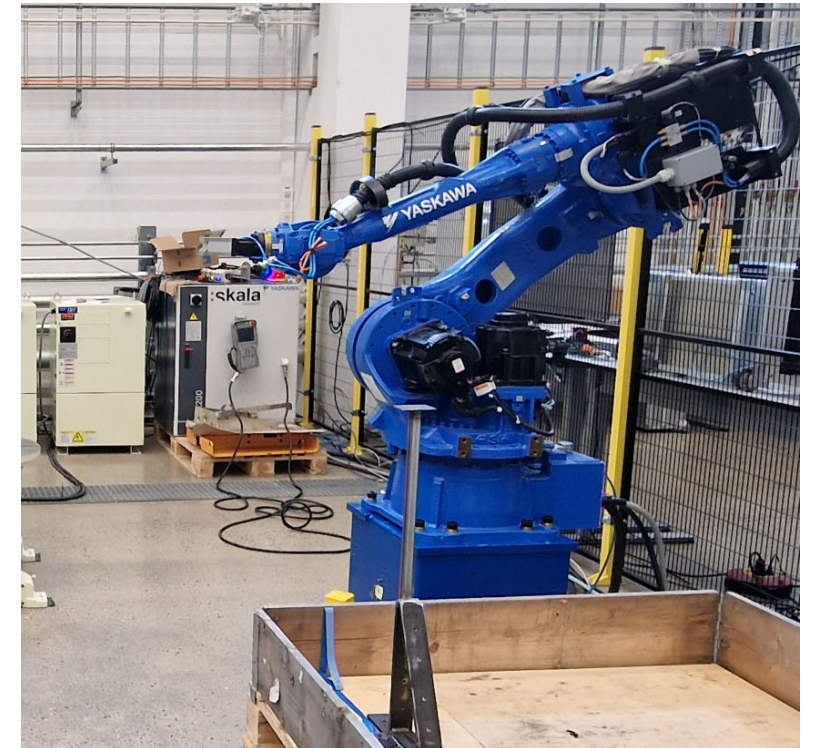
EMERALD International summer school – unique scientific and cultural experience

Introduction to Bio-mechatronics



Prof. Filippo Sanfilippo – University of Agder (Norway)

Visiting of the UiA laboratories



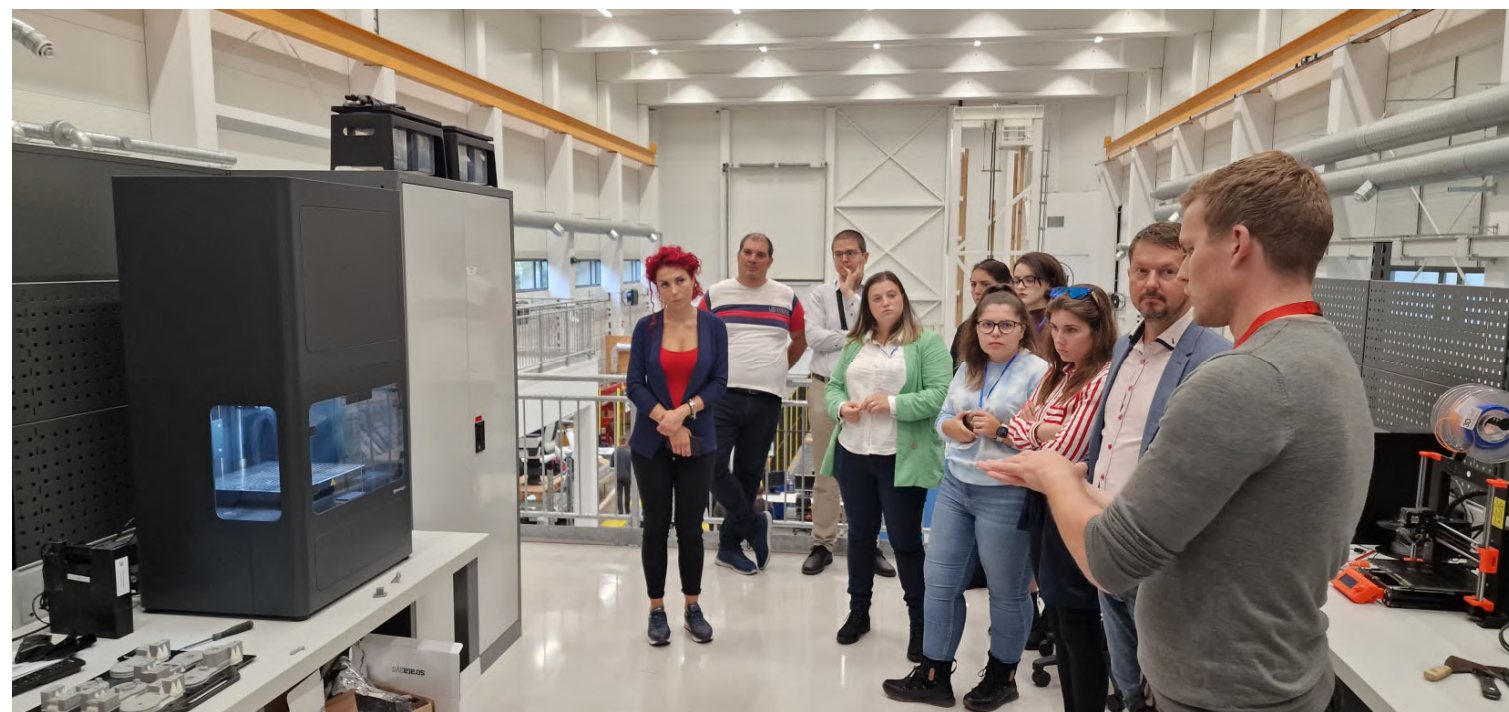
Visiting of the MIL laboratory (University of Agder, Norway)

Visiting of the UiA laboratories



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Visiting of the UiA laboratories



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Visiting of the UiA laboratories



Visiting of the MIL laboratory (University of Agder, Norway)

Visiting of the UiA laboratories



Visiting of the i4Helse laboratory (University of Agder, Norway)

Visiting of the UiA laboratories



Visiting of the i4Helse laboratory (University of Agder, Norway)

CAD lecture



CAD lecture held by Prof. Filip Gorski, Poznan University of Technology, Poland

Launching of case studies and requirements



Case 1: bicycle prosthesis

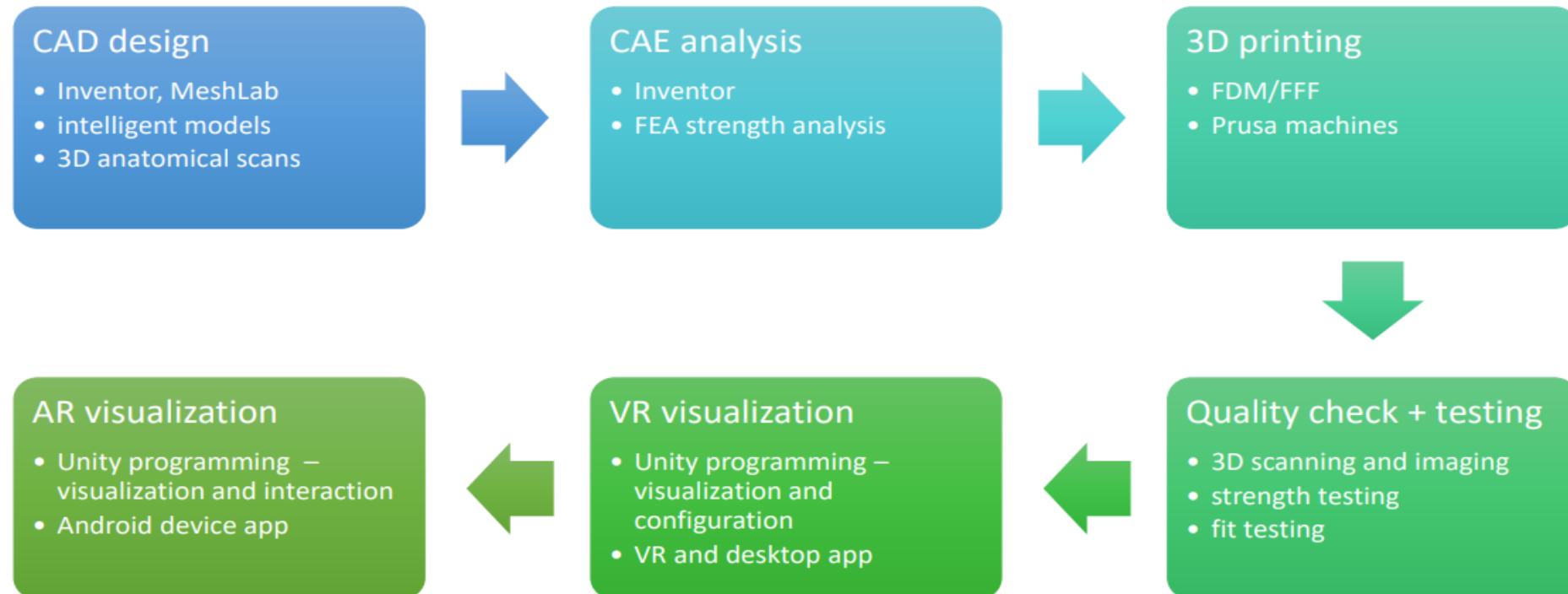


Case 2: hand orthosis

Launching of case studies by Prof. Filip Gorski, Poznan University of Technology, Poland

Launching of case studies and requirements

COURSE OF WORK WITH THE CASES



Launching of case studies and requirements

COURSE OF WORK WITH THE CASES

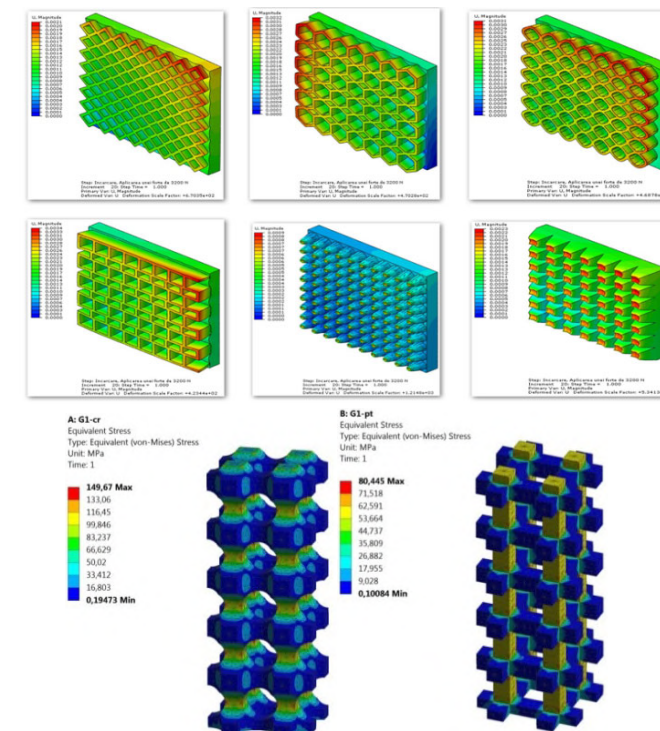
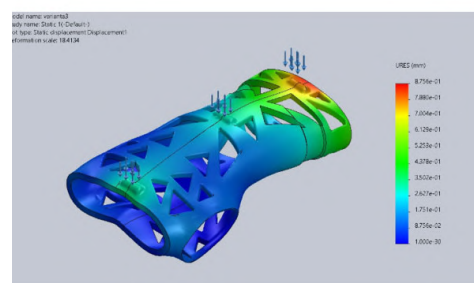
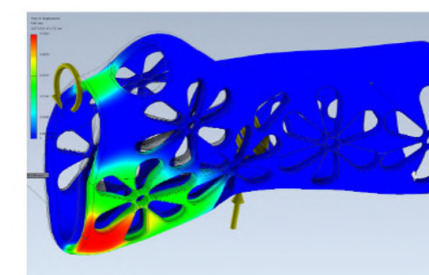
- week 1 – CAD design of anatomical products; CAE analysis of selected aspects; 3D printing and testing
- week 2 – building PC VR application (configurator with interaction), building Android AR application (visualization with interactions)
- organizing: groups of maximum 5-6 people with a leader
- beginning of week 2 – summary of week 1 activities
- end of week 2 – final presentation and awards

Launching of case studies and requirements

FINAL REPORT & PRESENTATION

- final report & presentation must contain information about all the 6 stages of work (CAD, CAE, 3D printing, testing, VR, AR)
- presentation should be a live demo of obtained products + created applications + possibly videos
- necessary: proper fault-free design, usable parts, operational applications
- nice-to-have: large dose of creativity!

CAE lecture



CAE lecture held by Associate Prof. dr.eng. Răzvan Păcurar (TUCN -Romania)

3D printing lecture



3D printing lecture held by Associate Prof. dr.eng. Răzvan Păcurar (TUCN -Romania)

3D printing presentation



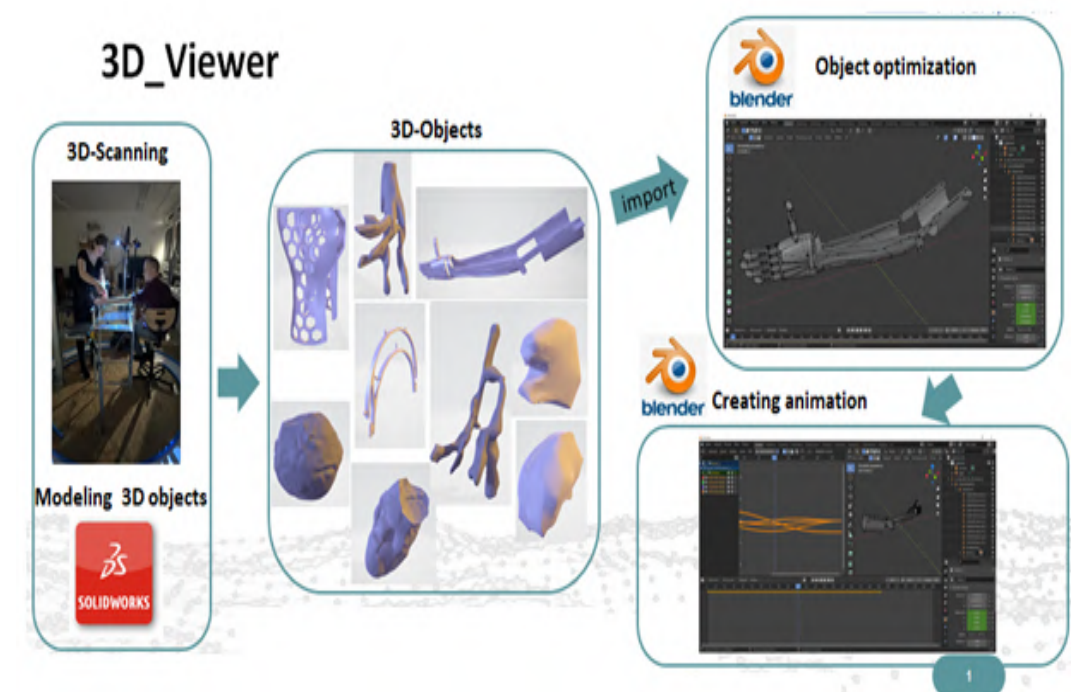
3D printing presentation held by Assistant dr.eng. Magdalena Zukowska (PUT Poznan, Poland)

VR lecture



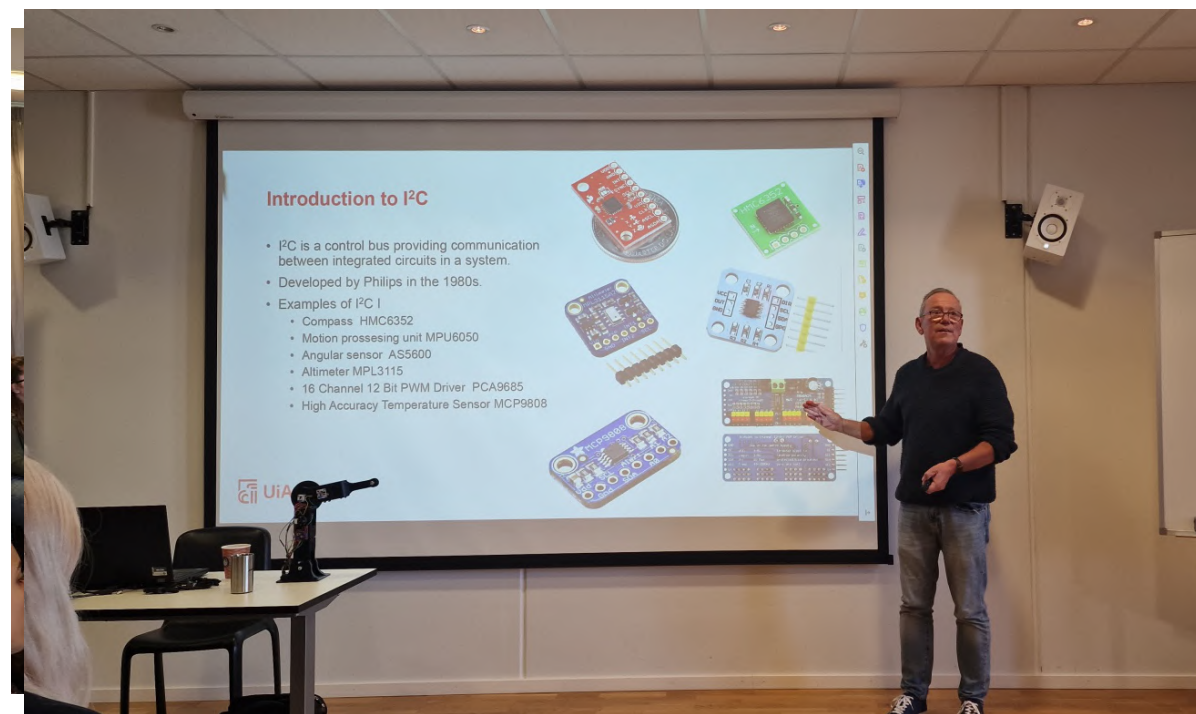
VR lecture held by Prof. Filip Gorski, Poznan University of Technology, Poland

AR presentation



AR presentation held by Michal Gallia, programmer – BIZZCOM s.r.o, Slovakia

Sensors and actuators lectures



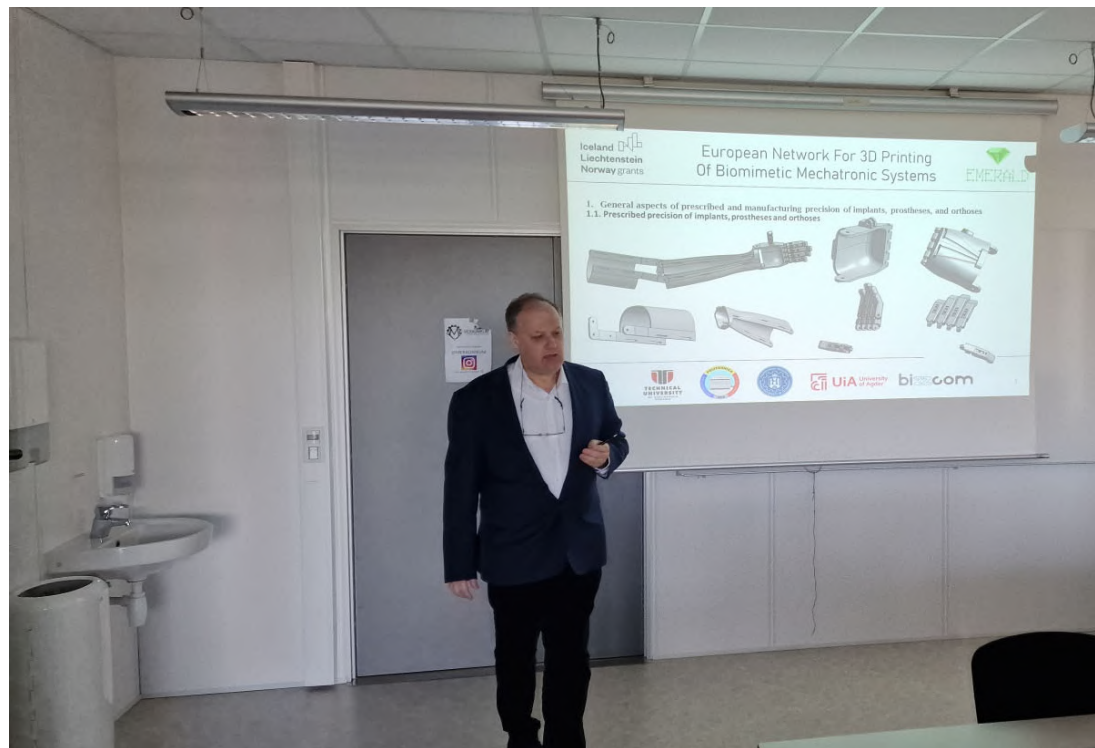
Sensors and actuators lectures held by Prof. dr.eng. Morten Ottestad (University of Agder, Norway)

Intelligent (smart) materials lecture



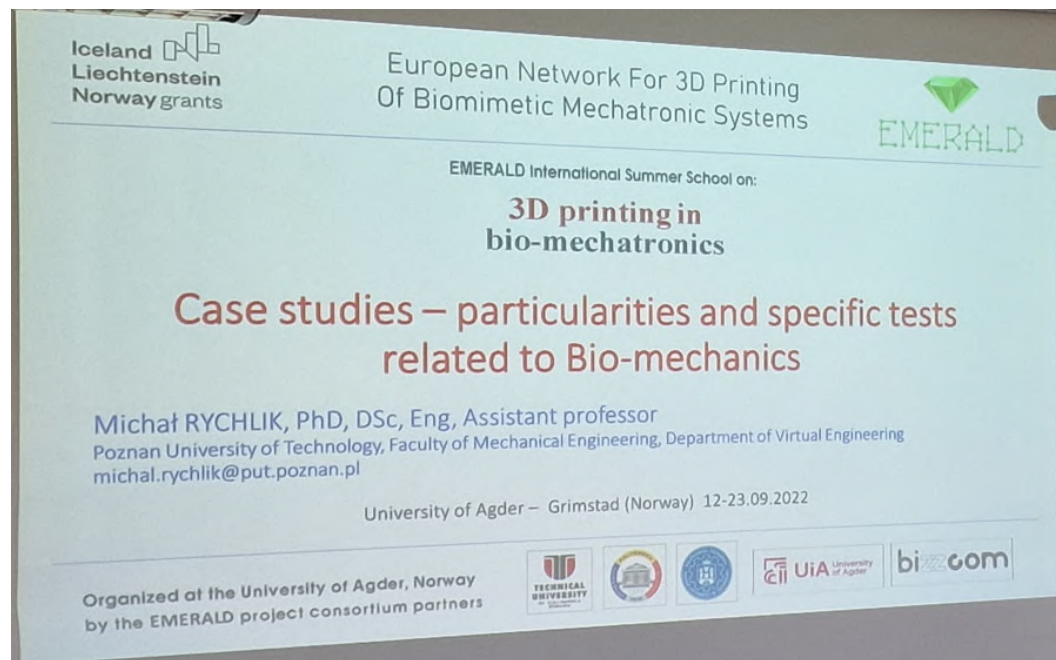
Intelligent (smart) materials lecture held by Associate prof.dr.eng. Diana Baila (University Politehnica Bucharest, Romania)

Metrology of mechatronic systems lecture



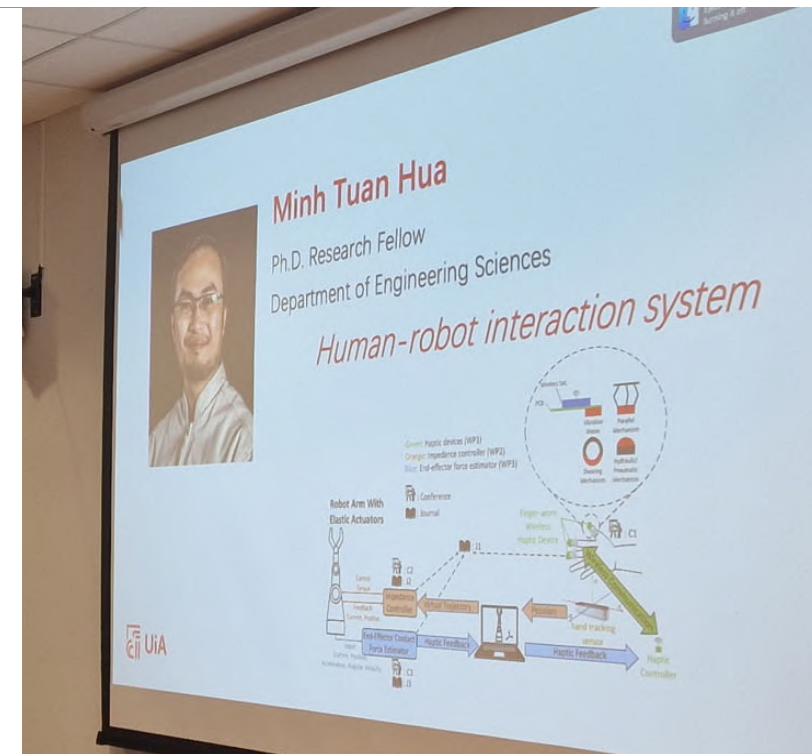
Metrology of mechatronic systems lecture held by prof.dr.eng. Nicolae Ionescu (University Politehnica Bucharest, Romania)

Case studies - particularities and specific tests related to Bio-mechanics presentation



Case studies - particularities and specific test related to Bio-mechanics presentation held by assistant prof. dr.eng. Michal Ryckhik (Poznan University of Technology, Poland)

Admittance vs impedance control presentation



Admittance vs impedance control presentation held by PhD student Minh Tuan Hua (University of Agder, Norway)

Working in groups with students



Working on CAD / CAE / 3D printing topics for the case studies launched by Prof. Filip Gorski

Working in groups with students



Working on CAD / CAE / 3D printing topics for the case studies launched by Prof. Filip Gorski
constructive and nice interactions between students coming from different countries / universities

Working in groups with students



Working on the mechatronic system developed by the students at the University of Agder, Norway
constructive and nice interactions between students coming from different countries / universities

Working in groups with students



Working on CAD / CAE / 3D printing topics for the case studies launched by Prof. Filip Gorski
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Working in groups with students



Working on the mechatronic system developed by the students at the University of Agder, Norway
constructive and nice interactions between professors and professors coming from different countries / universities

Working in groups with students



Working on CAD / CAE / 3D printing topics for the case studies launched by Prof. Filip Gorski
constructive and nice interactions between professors and companies

Invited professor



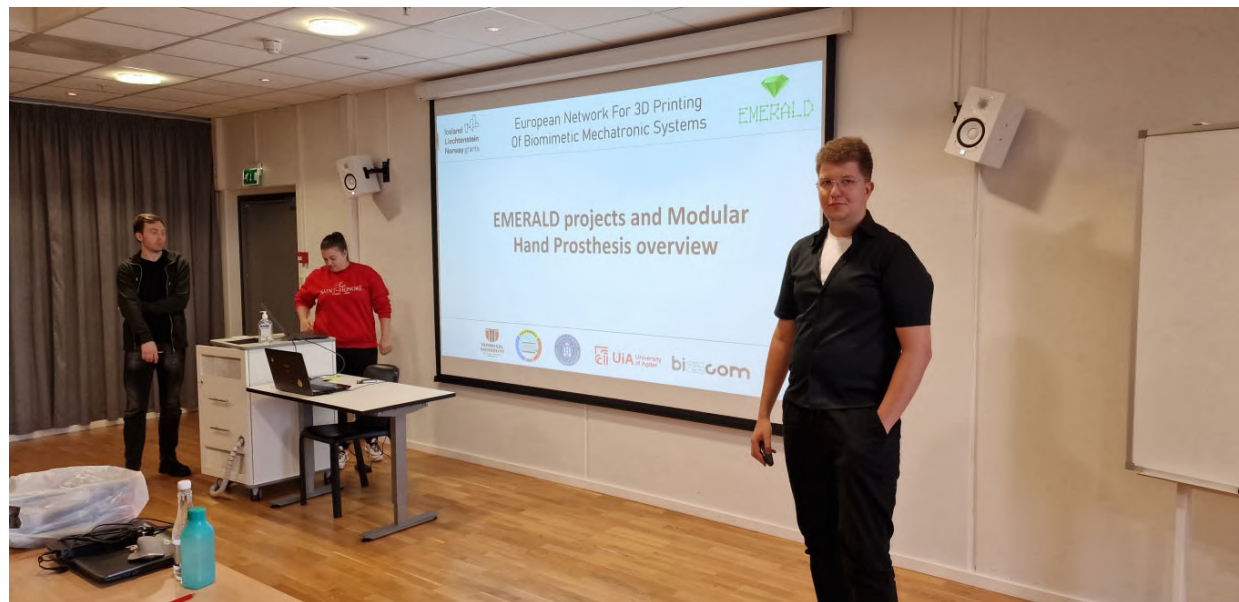
Invited professor Dr. Sven Maricic (University Juraj Dobrila, Croatia providing one lecture about 3D printing and VR methods in mechatronics

Final test defended by the students



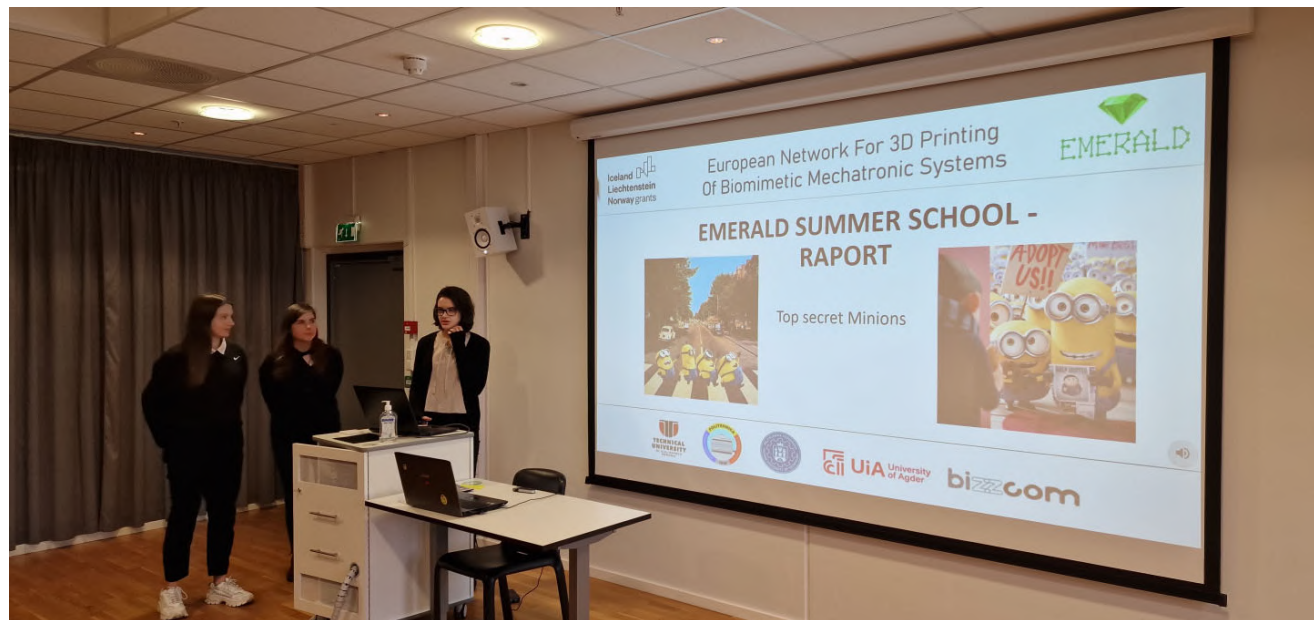
Final test defended by the EMERALD students

Final presentations realized by the students



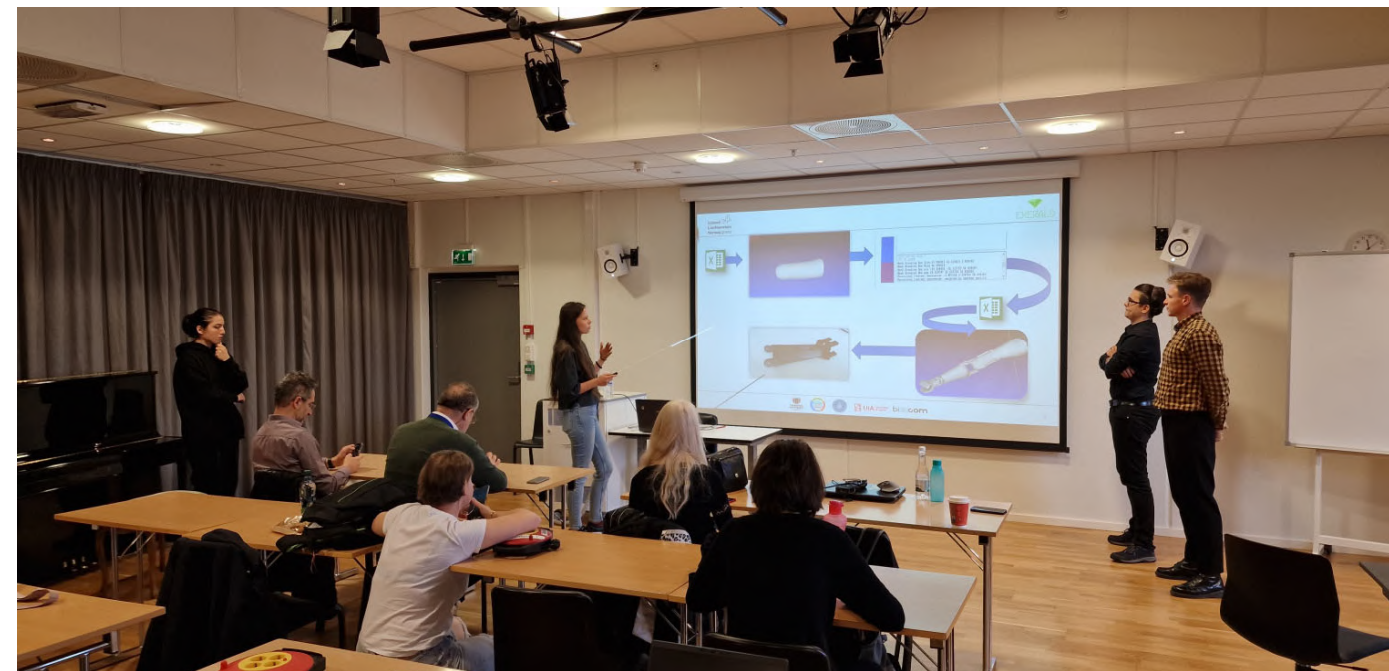
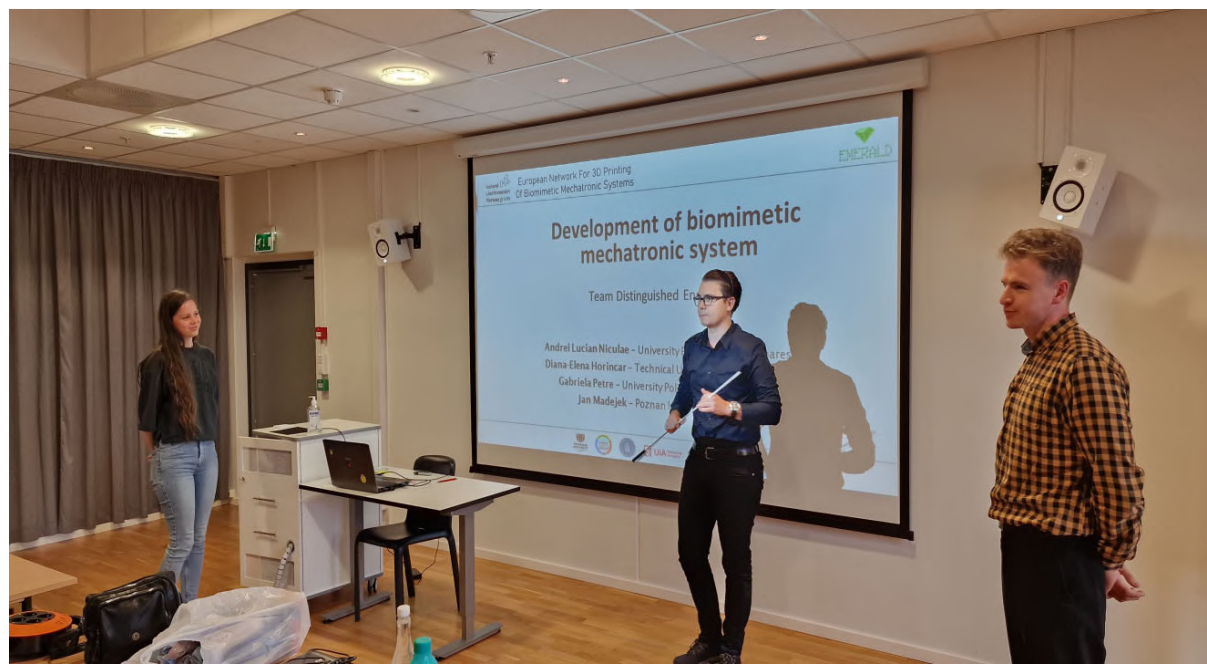
Final presentations realized by the EMERALD students

Final presentations realized by the students



Final presentations realized by the EMERALD students

Final presentations realized by the students

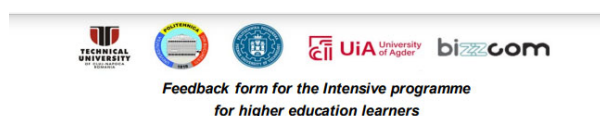


Final presentations realized by the EMERALD students

Final presentations realized by the students



Final presentations realized by the EMERALD students



Name of the meeting:	EMERALD International Summer School 2022
Objectives of the meeting:	Summer School "3D printing in bio-mechatronics"
Organizer:	University of Agder (UiA), Norway
Dates of the meeting:	12-23 September 2022
Location of the meeting:	Grimstad, Agder - Norway

Instructions: Please indicate your level of agreement with the statements listed below, on a scale from 1 to 5, where:

- 1 - Strongly disagree 3 - Neutral 5 - Strongly agree
2 - Disagree 4 - Agree

A. Objectives of the meeting

Statement	Score				
	1	2	3	4	5
1. The objectives of the meeting were clearly defined.					
2. The objectives were met during the meeting.					
3. All the relevant topics were covered during the meeting.					
4. The content was well organized and easy to follow.					
5. I obtained useful information and knowledge that will help me throughout the project.					

B. Organization of the meeting

Statement	Score				
	1	2	3	4	5
6. The meeting was well organized.					
7. The facilitator was knowledgeable about the discussed topics.					
8. The facilitator was dedicated and supportive.					
9. Participation and interaction were encouraged.					
10. The schedule and the agenda were observed throughout the meeting.					
11. The materials distributed were useful.					
12. The time allocated for the meeting and for the activities, was sufficient.					
13. The meeting room and facilities were adequate and comfortable.					

Iceland
Liechtenstein
Norway grants

EMERALD

Uia University of Agder

CERTIFICATE OF ATTENDANCE

This is to certify that

Name and Surname

has attended the EMERALD International Summer School on:

3D Printing in Bio-Mechatronics
from 12.09.2022 to 23.09.2022

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

Prof. Dr. Eng. Filippo Sanfilippo,
Partner of EMERALD project

In cooperation with

EMERALD International Summer School on:
3D Printing in Bio-Mechatronics
is organized at the University of Agder, Norway by the
EMERALD Project consortium partners

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

Certificate of attendance Intensive Programme activities

I undersigned Prof. Sunniva Whittaker

position Rector

representing the host organisation: University of Agder (UiA)

address: Postboks 422, 4604 Kristiansand, Norway

city: Kristiansand, country Norway

certify that the following persons:

staff student

Mr. Michal Gallia

X

Mr. Martin Zelenay

X

representing the sending organisation:

complete name: Bizzcom s.r.o.

address: Šľachtiteľská 591/2, 919 28 Bučany, Slovakia

city: Bučany, country Slovakia

were present from 12.09.2022 to 23.09.2022

attended a short term mobility organised in: Grimstad, Agder, Norway

Short term joint staff training events

Blended mobility

X Intensive study programme

Place: Kristiansand date 23.09.2022

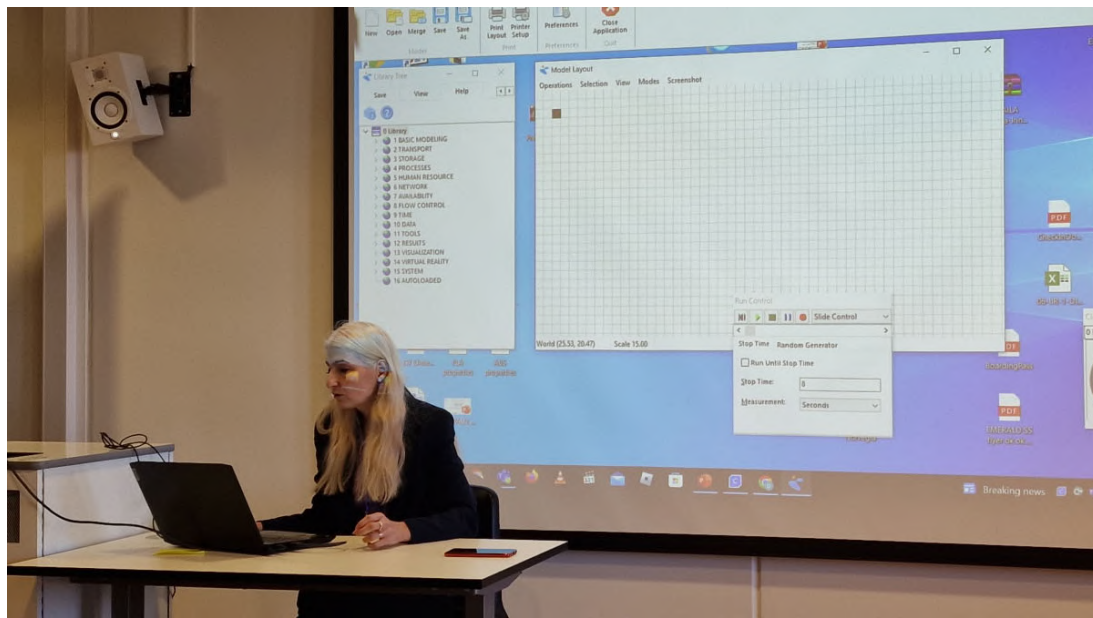
The host organisation: University of Agder (UiA)

(signature of the legal representative & stamp if applicable)

Feedback forms and certificates provided to the EMERALD International summer school participants



Companies presentations and feedbacks



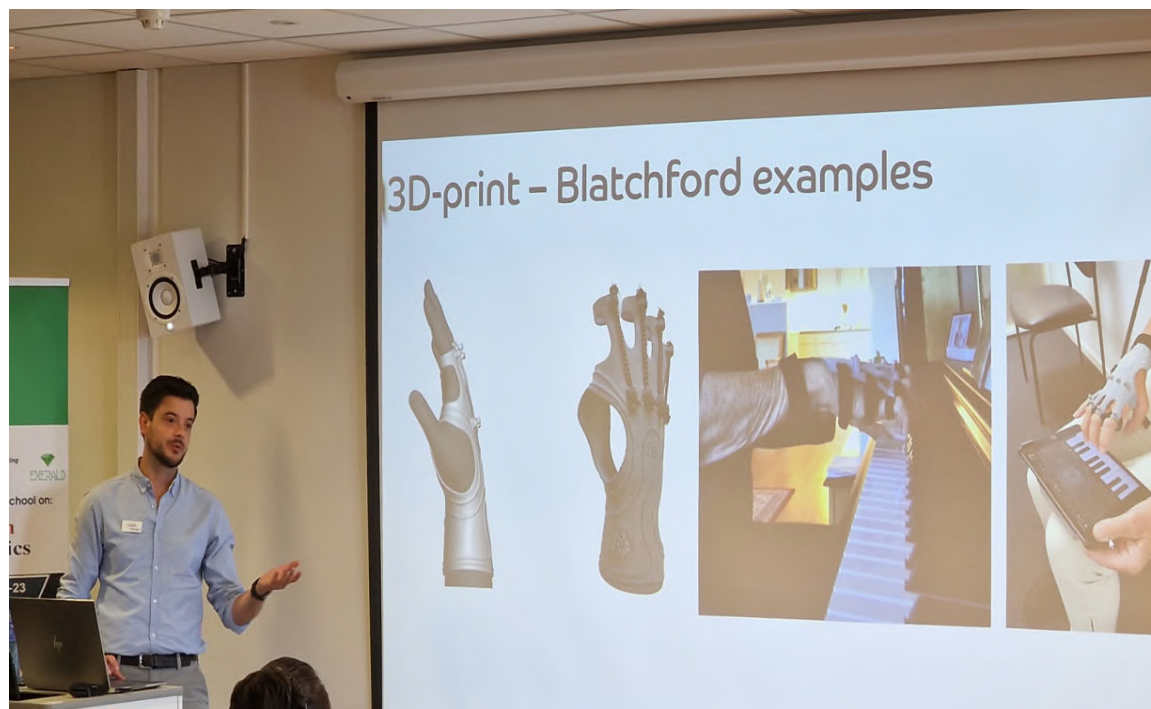
Enterprise dynamics workshop + presentations of the Admasys and Leycom companies of Romania - provided by Associate prof.dr.eng. Diana Baila from University Politehnica Bucharest (Romania)

Companies presentations and feedbacks



Blatchford ortopedi Norway company presentation - case studies revealed by Physiotherapist & Department leader of Blatchford Arendal - Bjarne Lindebo

Companies presentations and feedbacks



Blatchford ortopedi Norway company presentation – CPO – Head of development & 3D print in Blatchford Norway
– Luis Rodrigues

Companies presentations and feedbacks



Blatchford ortopedi Norway company presentation - case studies revealed by Physiotherapist– Bjarne Lindebø

Companies presentations and feedbacks



Open discussions between Blatchford ortopedi Norway company representatives and professors / students of the EMERALD International summer school in Norway

Companies presentations and feedbacks



Open discussions between Blatchford ortopedi Norway company representatives and professors / students of the EMERALD International summer school in Norway

Ending of the first edition of the EMERALD International summer school



Ending up of a very intense , but consistent period of the EMERALD International summer school in Norway (2022 edition)

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European Network For 3D Printing Of Biomimetic Mechatronic Systems



Ending of the first edition of the EMERALD International summer school



European Network For 3D Printing Of Biomimetic Mechatronic Systems



EMERALD project - contact details



www.project-emerald.eu



www.project-emerald.eu

email addresses:

EMERALD project: emerald.project2022@gmail.com

Assoc. Prof.dr.eng. Razvan Pacurar - razvan.pacurar@tcm.utcluj.ro

Assoc. Prof.dr.eng. Sergiu Dan Stan - sergiu.stan@mdm.utcluj.ro

