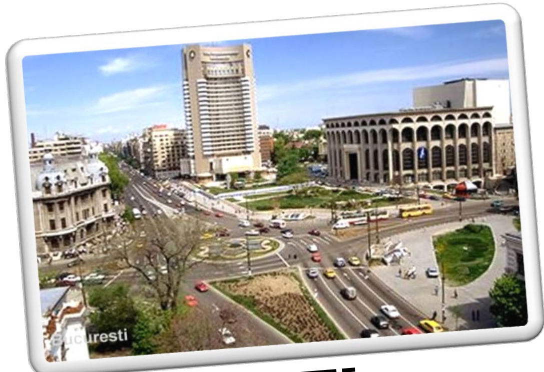
POLITEHNICA University of Bucharest
Faculty of Industrial Engineering and Robotics
Manufacturing Engineering Department

SOME DATA ABOUT ROMANIA

Population: 19.631.292 habitants
Surface: 238391 km^2 (4,8% Europe)
Capital: Bucharest (1.920.610 hab.)
Main important cities:
Iaşi, Cluj-Napoca, Timişoara, Constanţa
Neighbours:
SW – Serbia, NW – Hungary, N – Ukraine, E – Republic of Moldova and Ukraine, S – Bulgaria , SE – Black Sea
Religion: 85,9% Orthodox, 4,6% Romano-Catholic, 3,2% Reformed, 1,9% Pentecostal, 0,3% Muslims (Turkish 0,2% in Constanţa)
Life expectancy at birth - 70.62 years
National day: 01 December (Union Day)
Romanian currency: LEU (RON)
(1 € = 4.94 RON) (1 USD = 4.42 RON)
Presidential elections: once every 5 years

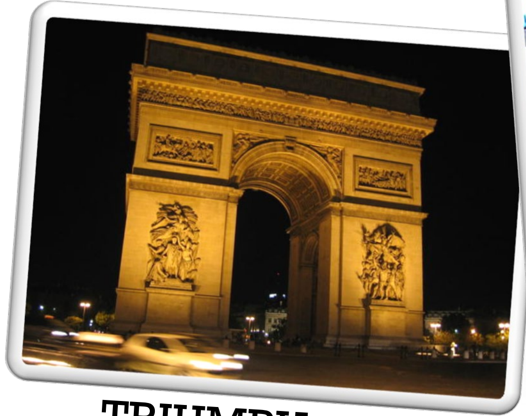
BUCHAREST (BUCUREŞTI)



UNIVERSITY SQUARE

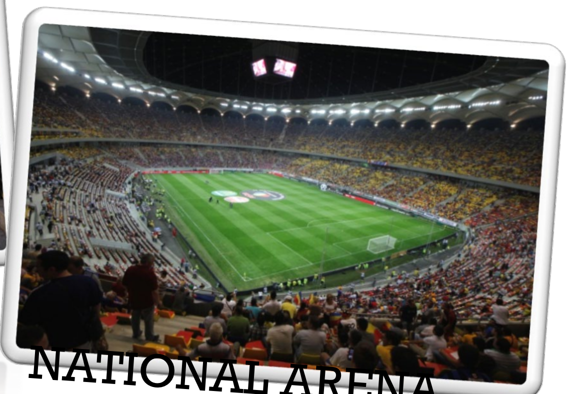
ROMANIAN ATHAENEUM

PARLIAMENT PALACE



TRIUMPH ARCH

OLD CENTER



NATIONAL ARENA STADIUM

Facts and figures

Romania is the **6th country in the world regarding the number of certified IT specialists per capita**, thanks to its educational system that favors multilingual and technical skills. Higher education in the IT area is provided by 5 top polytechnic universities, 59 domain specific universities, and 174 private colleges, which together produce over 5.000 computer science and engineering graduates per year.

Romania is situated in the **top 5 worldwide regarding skills in computer technical support**, technical help desk, network technical support, computer electronics, telecommunications ..

Romanian academic system

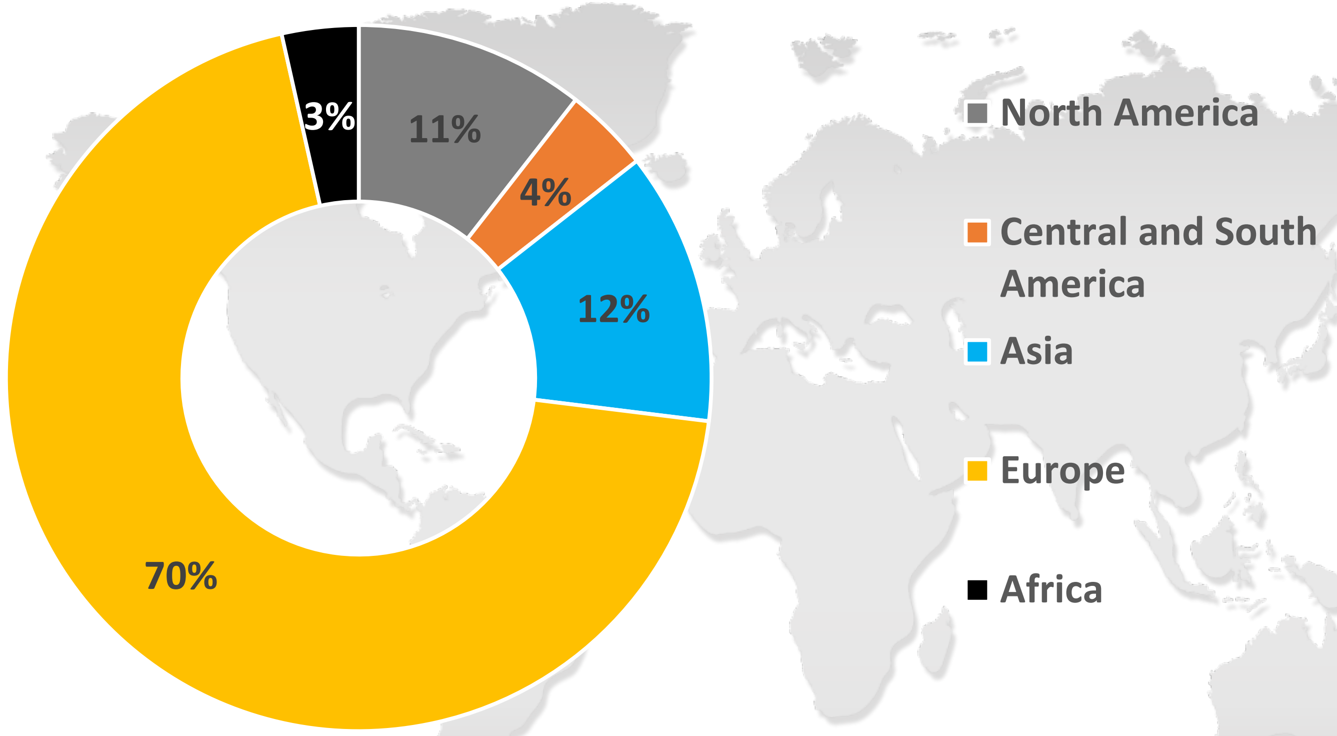
56 state universities

28 private universities

Bucharest

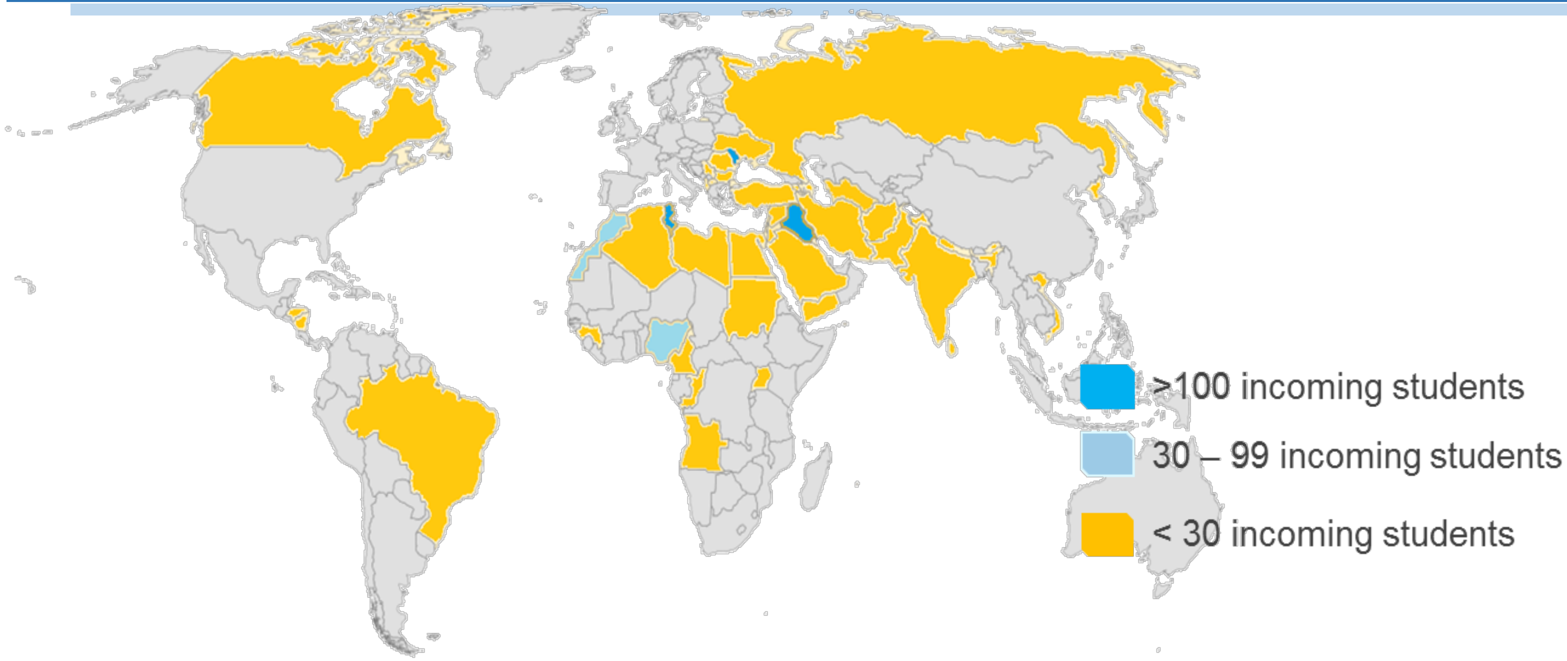
- POLITEHNICA University
- Civil Engineering University
- Architecture University
- Agronomy and Vet Medicine University
- The Bucharest University
- Medicine and Pharmacy University
- Economic Studies Academy
- National Music University
- National Arts University
- Theater and Movie National University
- National Sport Academy
- National School for Political Studies

UPB on the World Map
Cooperation Agreements



UPB has settled over 265 signed inter-university mobility agreements and well over 150 Memorandums of Understanding with universities across the world.

UPB on the World's Map
International Students

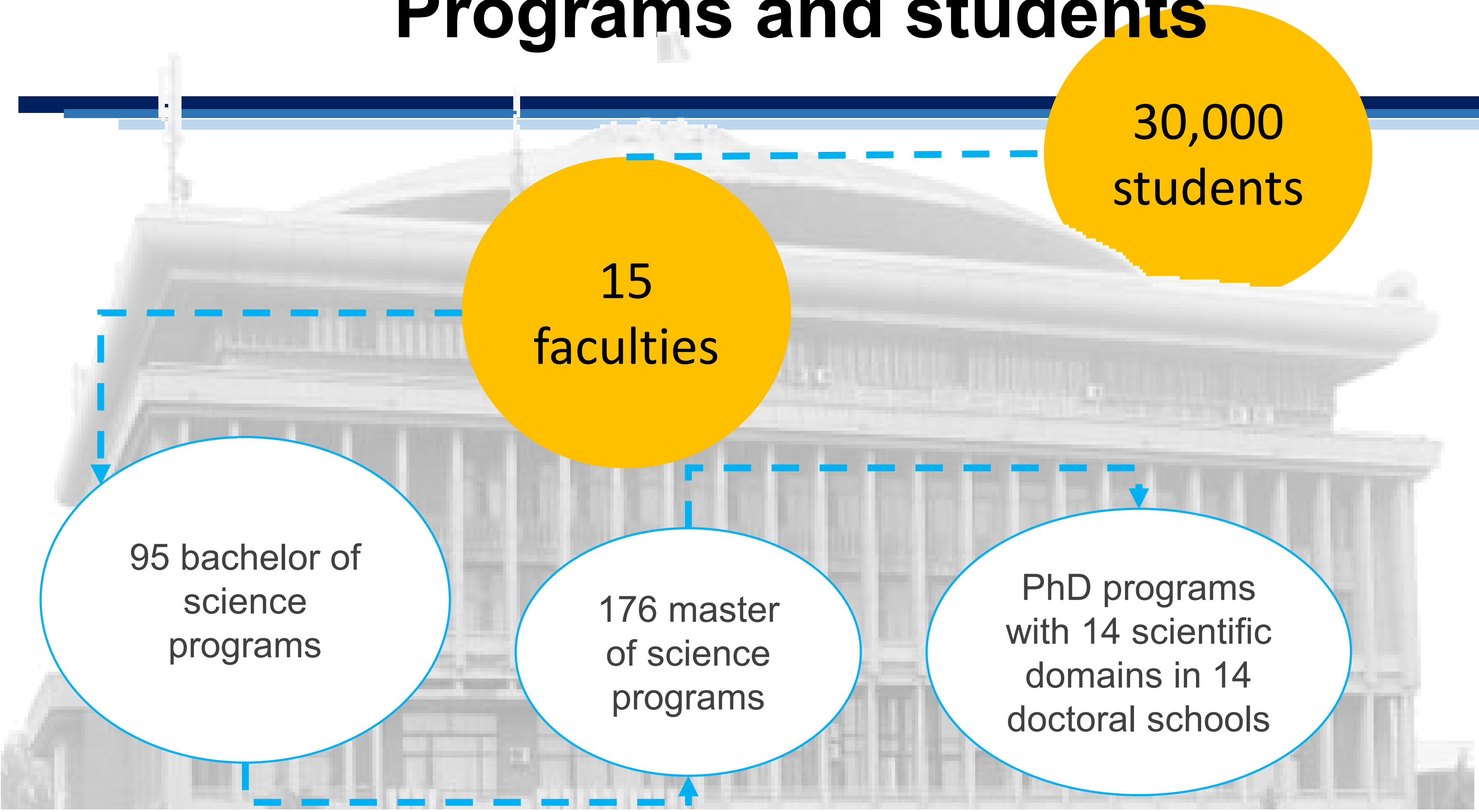


Aside from own students – which we promote in the international environment – UPB receives over 800 foreign students every year from 55 countries.

UPB on the World Map
International Associations Membership

UPB is part of over 20 larger academic associations: European University Association (EUA), The Conference of European Schools for Advanced Engineering Education and Research (CESAER), L' Agence Universitaire de la Francophonie (AUF), European Distance and E-Learning Network Ltd. (EDEN) etc.

Programs and students



UPB is an international technical university with around 30,000 students from more than 55 countries.

Undergraduate Studies in English(BSc)

FACULTY OF INDUSTRIAL ENGINEERING AND ROBOTICS

- Industrial Engineering (bachelor & master)

The Faculty of Electronics

- Microelectronics, optoelectronics and nanotechnology
- Networking and telecommunications software
- Technology and telecommunications systems

The Faculty of Engineering in Foreign Languages:

- Electronics and Telecommunications Engineering (English, French)
- Computers and Information Technology (English, French)
- Applied Electronics (English, French, German)
- Mechanical Engineering (English, French, German)
- Chemical Engineering (English, French)
- Materials Engineering - Materials Science (English, French)

Faculties of UPB

- Electrical Engineering
- Power Engineering
- Automatic Control and Computer Science
- Electronics, Telecommunications and Information
- Mechanical Engineering and Mechatronics
- **Industrial Engineering and Robotics (FIIR)**
- Biotechnical Systems Engineering
- Transports

Faculties of UPB

- Aerospace Engineering
- Materials Science and Engineering
- Applied Chemistry and Materials
- Engineering in Foreign Languages
- Applied Sciences
- Medical Engineering
- Entrepreneurship, Business Engineering and Management

Academic studies

Bachelor studies (4 years)

Master’s studies (2 years)

Postgraduate studies (1/2 years)

Doctoral studies (3 years)

FIIR Faculty structure

INDUSTRIAL ENGINEERING
- MANUFACTURING ENGINEERING
- NANOTECHNOLOGIES AND UNCONVENTIONAL SYSTEMS
- ENGINEERING AND QUALITY MANAGEMENT
- MACHINE AND PRODUCTION SYSTEMS
- INDUSTRIAL LOGISTICS
- WELDING ENGINEERING
- ENGINEERING SECURITY IN INDUSTRY
- INDUSTRIAL ENGINEERING
- INDUSTRIAL ENGINEERING APPLIED IFORMATICS

MECHATRONICS AND ROBOTICS
- ROBOTICS

ENGINEERING AND MANAGEMENT
- INDUSTRIAL ECONOMICS ENGINEERING

FIIR Faculty Board

DEAN

Prof. Dr. Eng. Ec.
Cristian DOICIN

DIRECTOR OF DOCTORAL SCHOOL

Prof. Dr. Eng.
Nicolae IONESCU

VICE-DEAN

International affairs, educational programmes from EU funds and study programmes in foreign languages

VICE-DEAN

Scientific research and patrimony

VICE-DEAN

Bachelor study programmes, quality assurance and continuous training

VICE-DEAN

Social activities, tutoring and the faculty visual identity

VICE-DEAN

Master study programmes and internships

VICE-DEAN

Connection with industrial environment, computerization

FIIR Departments

MANUFACTURING ENGINEERING DEPARTMENT

Prof. Dr. Eng.
Tom SAVU

MACHINE AND PRODUCTION SYSTEMS DEPARTMENT

Prof. Dr. Eng.
Tiberiu DOBRESCU

MATERIALS TECHNOLOGY & WELDING DEPT.

Prof. Dr. Eng.
Oana CHIVU

STRENGTH OF MATERIALS DEPARTMENT

Prof. Dr. Eng.
Dan CONSTANTINESCU

MECHANISMS THEORY & ROBOTICS DEPARTMENT

Prof. Dr. Eng.
Liviu UNGUREANU

FIIR students

PhD
308

Master
1275

Undergraduate
2320

Study Programme

Products – Quality – Profit

Speciali-zation		Production	Materials	Economics	Quality	CAE	Management
Sem.		Discipline					
I	1	Product Development 1					
	2	Quality Management					
	3	Business Management					
	4	Design & Ergonomy	New Materials	Concurrent Market Analysis	Product Quality	Geometric Modelling (1)	Industrial Logistics
	5	Detailed Design	Surface Engineering	Financial Management	Environm. & Life Quality	Sructures Analysis	Informatic Systems
	Total						

Study Programme

MSc / Master Level (Example)

Speciali-zation		Production	Materials	Economics	Quality	CAE	Management
Sem.		Disciplines					
II	1	Product Development 2					
	2	Project Management					
	3	3D Modelling	Comp. Aided Mould Design	Comp. Aided. Prod. Planning	Quality System	Geometric Modelling (2)	Modelling & Simulation of Ind. Systems
	4	Process Optimisation	Structures Analysis	Marketing	Quality Control & Improvement	Product Modelling	Ecology, Environm. & Industry
	5	Individual & Group Project (TEAMS ....)					
		Total					

Bachelor Programmes in Mnfg.Eng.Dept.

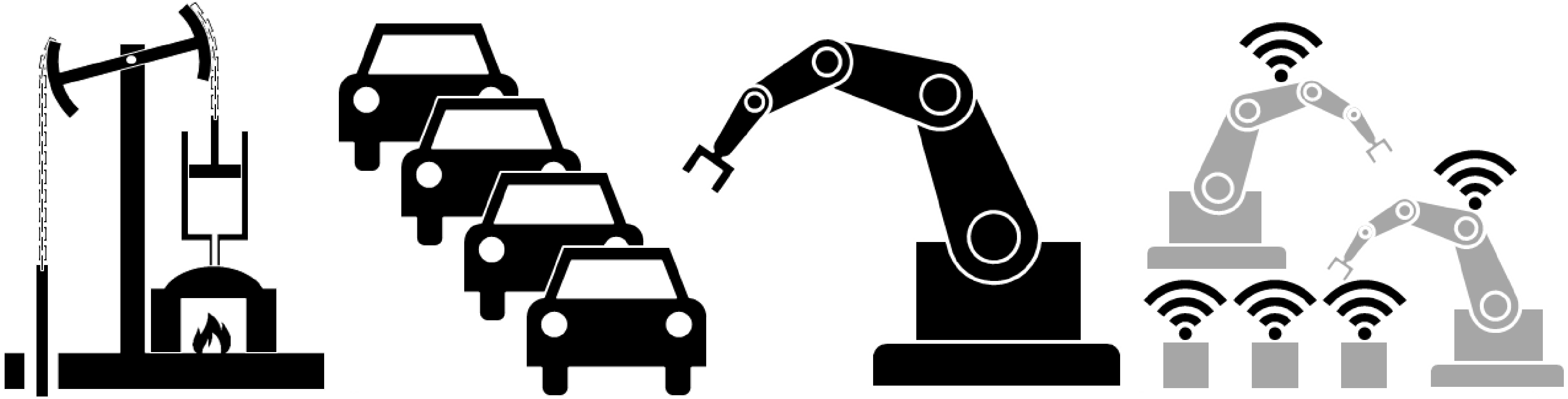
- Manufacturing Eng.
- Nano & Non-conventional Technologies
- Industrial Economics Eng.
- Applied Informatics in Industrial Engineering
- Industrial Informatics
- http://www.tcm.pub.ro

Master Programmes in Mnfg.Eng.Dept.

- Industrial Design
- Product Design & Mnfg. Eng.
- Advanced CAE
- Nanostructures & Non-conventional Technologies
- Economics Eng. & Business Management
- Quality in Eng. & Business Management
- Complex Projects Eng. & Management

Industry 4.0’s Challenges for the Industrial Engineering Curricula in the POLITEHNICA University of Bucharest

Industry 4.0 = The 4th Industrial Revolution



1st	2nd	3rd	4th
Mechanization, water power, steam power	Mass production, assembly line, electricity	Computer and automation	Cyber Physical Systems

Industry 4.0

In the intelligent Industry 4.0 factories, the **Cyber-Physical Systems** monitor physical processes, create a virtual copy of the physical world and take decentralized decisions.

CPSs communicate by using the **Internet of Things**, cooperating in real-time, both together and with the human resources.

Information storage and processing are performed using the **Cloud Computing**.

Cyber-Physical Systems

Internet of Things

Cloud Computing

Cyber-Physical Systems

CPSs are mechanisms, monitored or controlled by algorithms (software), which are integrated with the users through the Internet.

Physical and software components are interlaced on various spatial and temporal scales, possessing multiple and distinct behaviors and interacting in ways which are changing the context of the whole system.

CPSs examples: intelligent vehicles, medical monitoring systems, process control systems, robotic systems, automated pilots, intelligent houses, smart cities etc.

Involving multidisciplinary approaches, CPSs have the same basic architecture like IoT, but have a greater degree of combining and coordinating the physical components with the computational ones.

Internet of Things

IoT (informational society's infrastructure) describes the interconnectivity of intelligent elements (i.e. devices, vehicles, buildings) containing electronics, software, sensors, actuators and components connecting them to a data collecting and exchange network.

Intelligent elements may be thus remotely monitored and controlled, allowing the integration between the physical world and the computerized systems.

An estimated 50 billions intelligent elements will exist in 2020.

Sensors and actuators are transforming the IoT into a CPSs' instance.

Industrial IoT is using machines able to learn and the Big Data technology for acquiring, processing and using the data from the industrial sensors and automation systems

Cloud Computing

Partitioned, by request usage, by computers or by other devices, of Internet located data sets and computing resources.

University's challenges

Challenges are present during the all three stages in which the university acts in what concerns the knowledge:

Production

Transfer

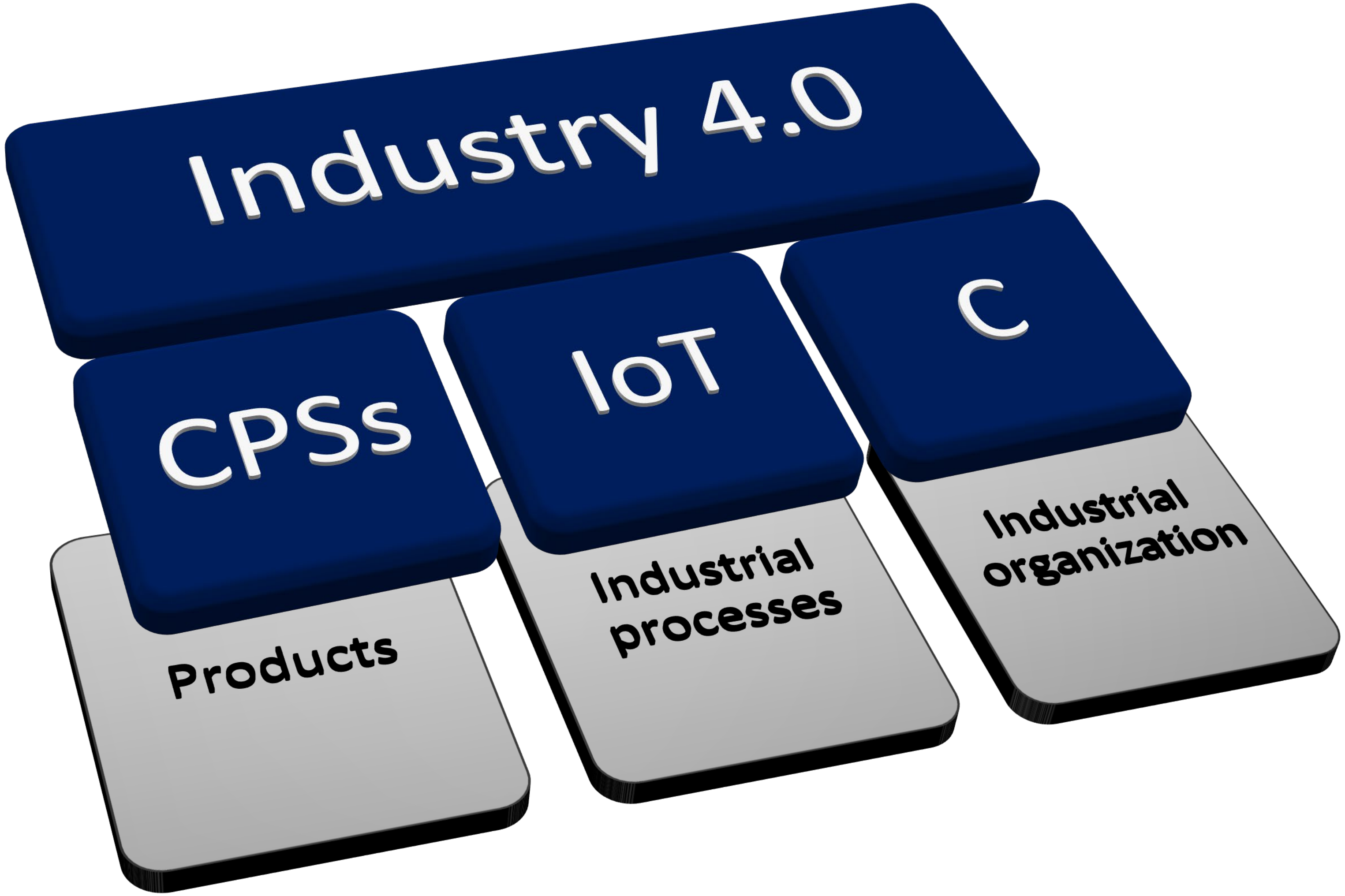
Valorization

University's challenges

Knowledge refers to:

- Products
- Industrial processes
- Industrial organization

University's challenges



Producing knowledge

About products:
- having CPS characteristics;
- monitored, controlled and communicating through the IoT;
- adding knowledge in C C and using this in the product design stage.

About processes:
- using machines, tools and equipment from the CPS category;
- monitored and controlled through IIoT, using organizational rules stored in C C and upgrading these rules.

About organization:
- using data and procedures stored in C C and upgrading these rules;
- using an CPS type infrastructure.

Transferring knowledge

- Using CPSs (didactic and experimental setups able to send data about their interaction with the user);
- Using IoT (remote and distributed labs);
- Using Cloud Computing (virtual labs, organization simulators).

Valorizing knowledge

- by developing Industry 4.0 applications;
- by offering IoT resources (setups and equipment);
- by offering Cloud Computing knowledge resources.

Thank You

University POLITEHNICA of Bucharest

Assoc. Prof. Dr. Eng. Băilă Diana-Irinel
University POLITEHNICA of Bucharest, Romania
Faculty of **Industrial Engineering and Robotics**

University POLITEHNICA of Bucharest

University POLITEHNICA of Bucharest is the oldest and most prestigious engineer school in Romania.

At present the University **POLITEHNICA** of Bucharest is formed by 15 different faculties.

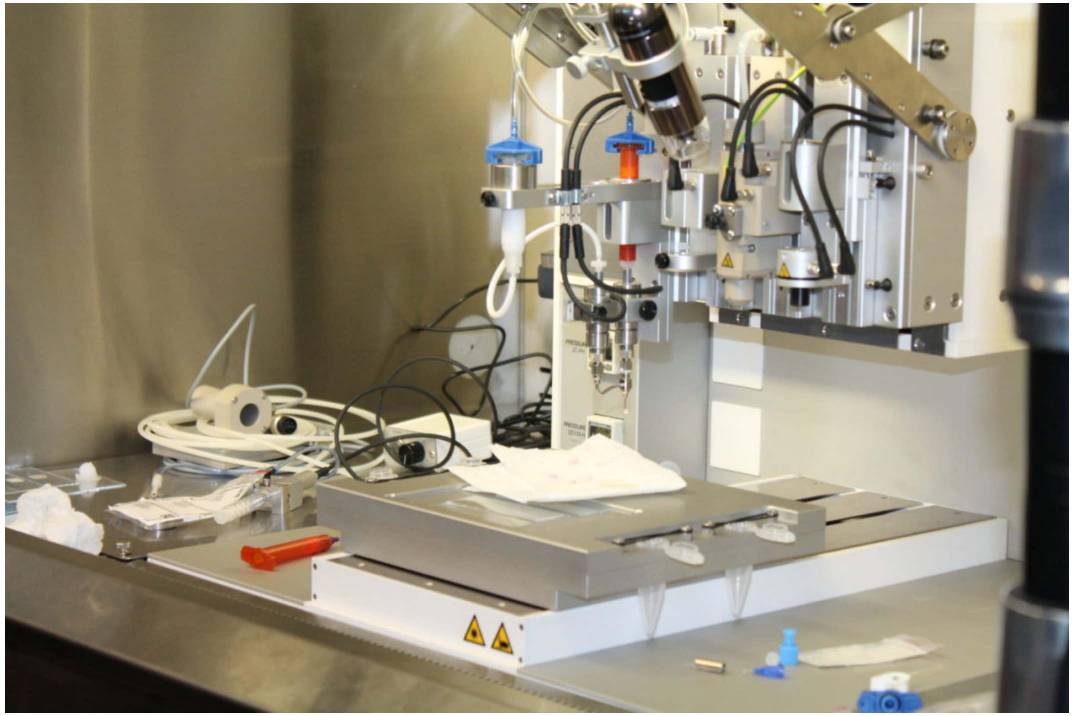
Most faculties are equipped with 3d printers that used FDM, DLP and SLA technologies.

In the Campus research center of University POLITEHNICA of Bucharest is the best performing 3d bioprinter from Romania.

https://upb.ro/

University POLITEHNICA of Bucharest

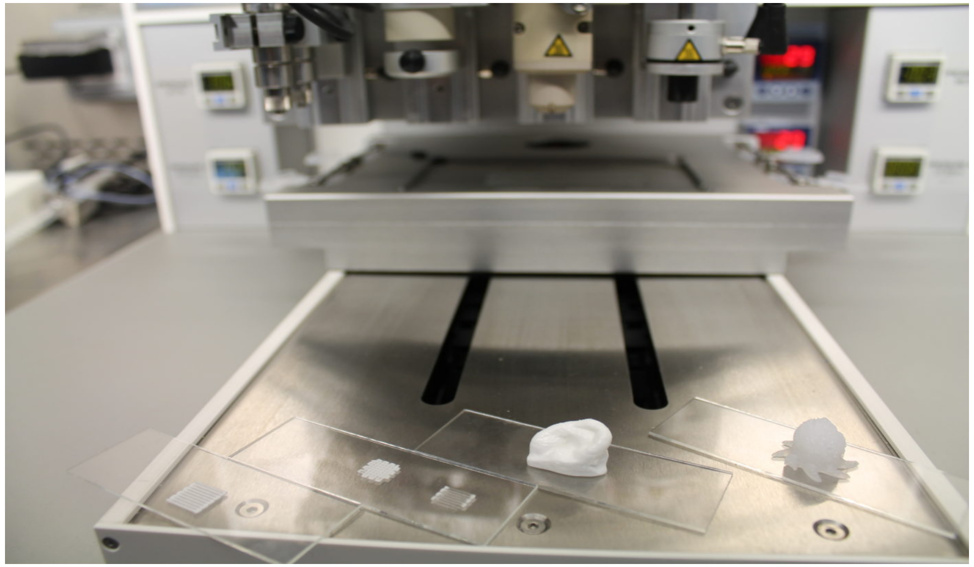
Firma ZSpot Media – RegenHU 3D Discovery



https://www.bioprintere.ro/bioimprimanta-3d-performanta-universitatea-politehnica-bucuresti/

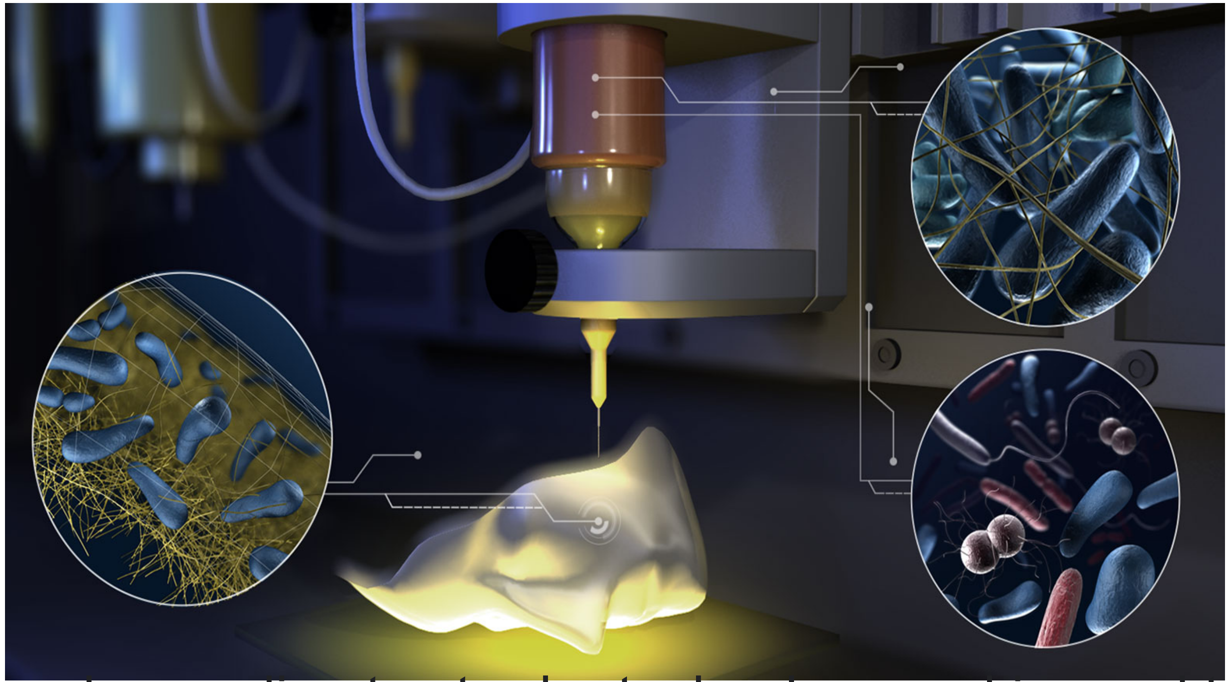
http://campus.pub.ro/website/fluide-nanostructures-and-soft-nanomaterials

Instruments, objects printed, 5 heads for bioprinting



https://www.bioprintere.ro/bioimprimanta-3d-performanta-universitatea-politehnica-bucuresti/

Dispencer head



The first type of printhead uses direct extruder technology and is used to pipette higher viscosity materials, such as hydrogels, ceramic pastes or calcium phosphate. The printhead is of the "syringe" type without heating, and the pipetting is done based on time-pressure technology.

https://www.bioprintere.ro/bioimprimanta-3d-performanta-universitatea-politehnica-bucuresti/

Cell-friendly ink-jet print head

The second type of printhead uses "cell friendly" ink-jet technology to print materials with lower viscosities, loaded with living cells. The heating system and the fine pipetting needle create all the necessary conditions for keeping the cells in viable conditions during printing.

Thus, its main applicability is the creation of biological tissues used in research, development and testing of pharmaceuticals and cosmetics. Also, together with the "direct dispenser" printing head, it can be used in the field of regenerative and reconstructive medicine, the components obtained being able to accurately mimic the consistency of bones and cartilage.

Co-axial print head

The third printhead has a unique system with two-components for simultaneous core-shell coaxial printing of two different materials, one on the outside and the second on the inside.

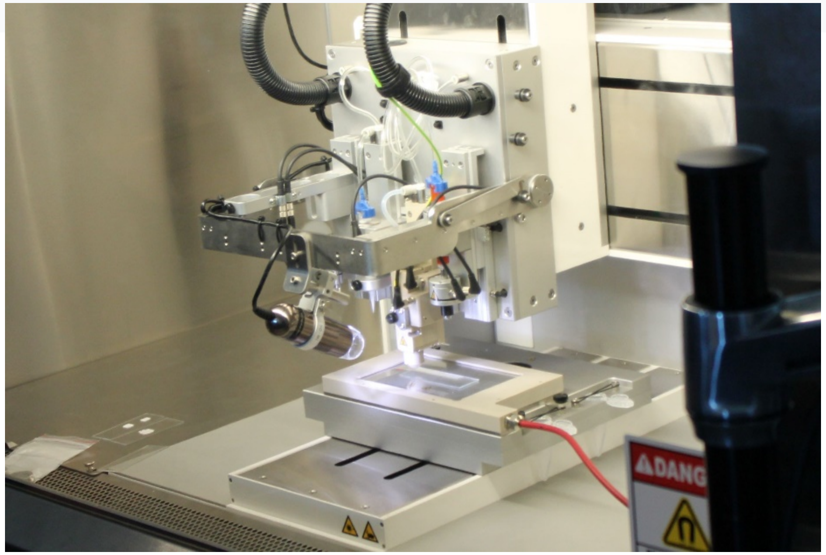
Both components of the printhead can dispense both simple biomaterials, such as hydrogels, alginates, hydroxyapatite or ceramic pastes, as well as cell-loaded biomaterials.

Thus, the co-axial printhead is very useful for printing tubular structures, similar to blood vessels.

https://www.bioprintere.ro/bioimprimanta-3d-performanta-universitatea-politehnica-bucuresti/

Electrofilation print head

Melt Electrospinning Writing allows to obtain extremely thin fibrous structures (+/- 5 microns) by melting polymers (eg: polycaprolactone, polyethylene glycol, polylactic acid, polypropylene, polyurethane, etc.). Melt Electrospinning allows 3D printing of non-toxic polymeric scaffolds that can be used successfully in tissue engineering. The electroplating kit also includes a 60+ zoom HD camera to monitor the scaffold printing process.



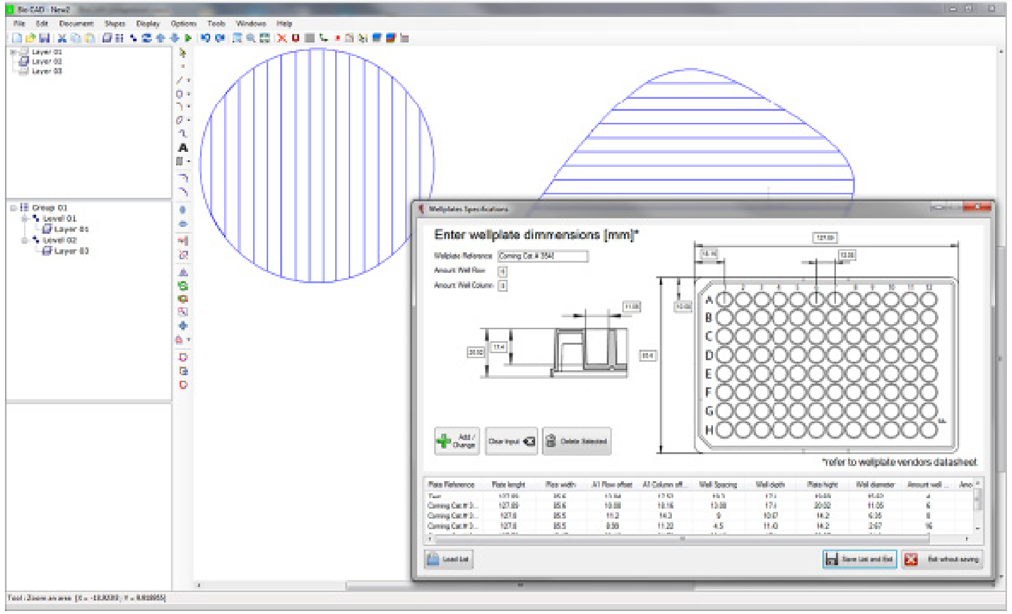
https://www.bioprintere.ro/bioimprimanta-3d-performanta-universitatea-politehnica-bucuresti/

Photoreticulation kit

The printer also has a UV lamp for photoreticulation, useful in 3D printing of various photosensitive materials and biomaterials (polymer resins). The lamp generates UV light specially adapted for living cell printing, in the visible light range 365nm (+/- 10nm). The 3D bioprinting system is completed by 3 different but complementary software components.

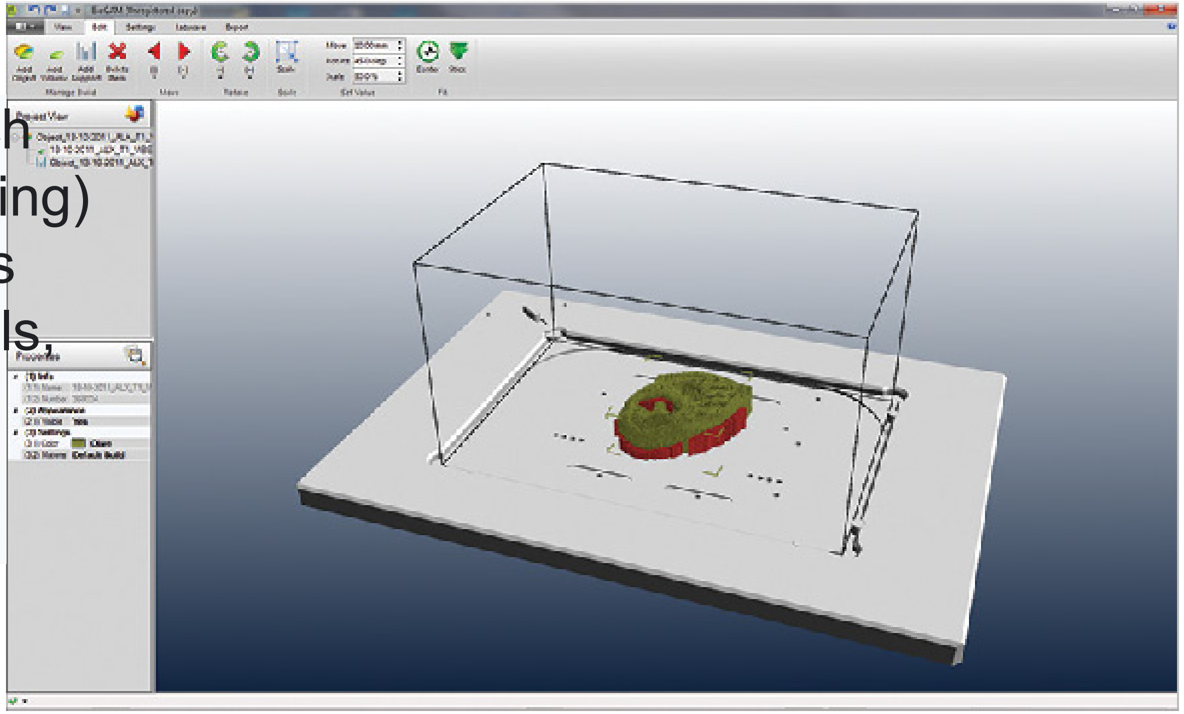
Software BioCAD

A first component is the BioCAD application, used for the design of scaffolds, patterns, tissues, etc. It includes all the tools needed to create models from multiple materials.



Software BioCAM

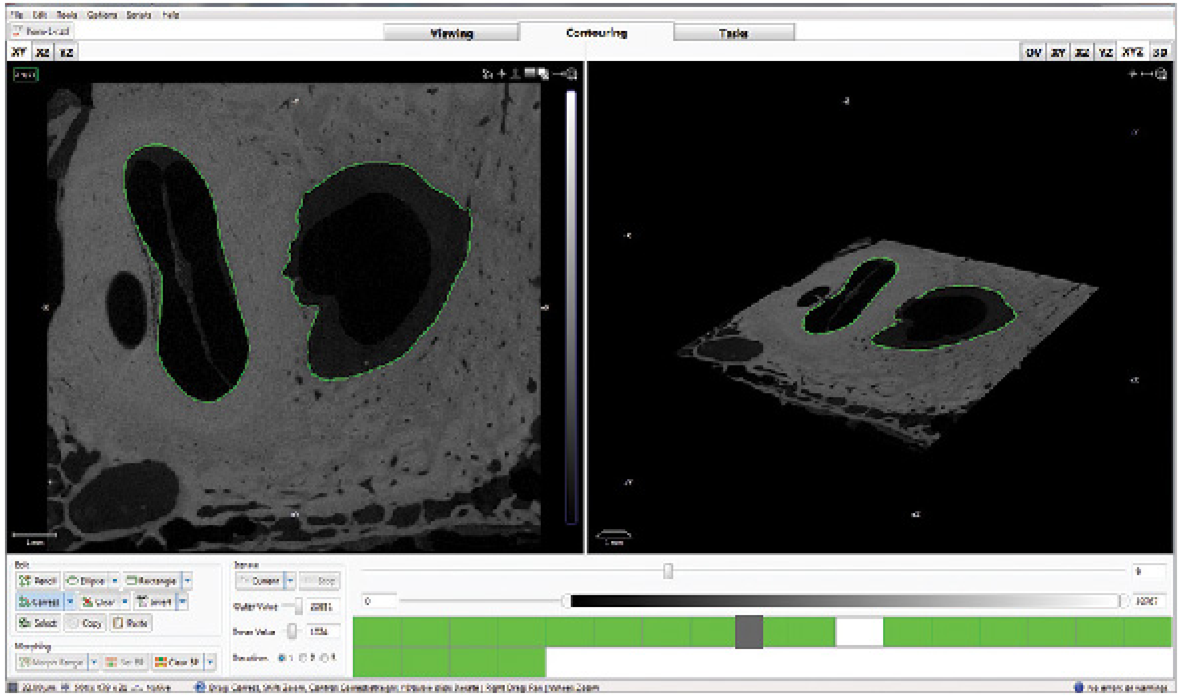
BioCAM is the second software component, which is used for generating, editing and preparing (slicing) three-dimensional models for bioprinting. It allows the creation of tissues containing various materials, based on models taken from CAD systems, 3D scanners or medical imaging equipment (computed tomography, radiology equipment).



https://www.bioprintere.ro/bioimprimanta-3d-performanta-universitatea-politehnica-bucuresti/

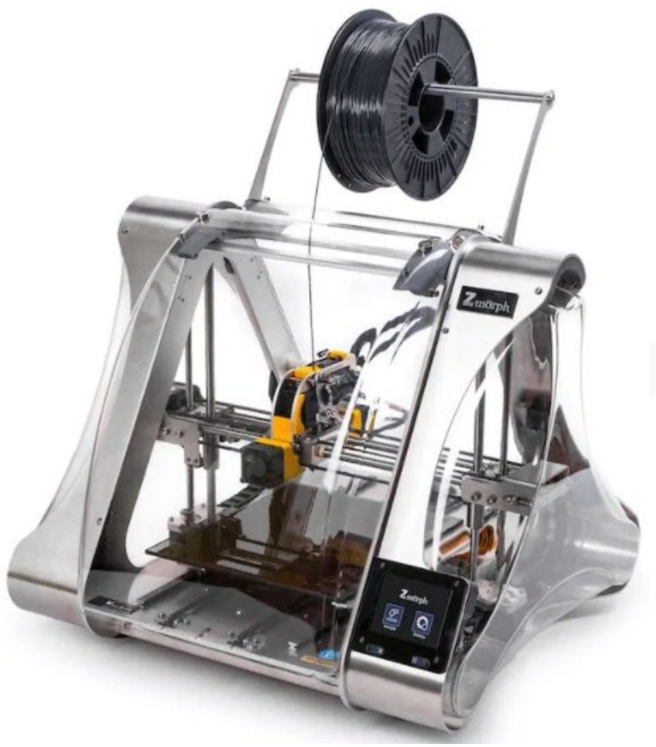
Software BioCUT

The third component is represented by BioCUT, which
is a DICOM type application for visualizing, analyzing
and integrating with the 3D bioprinting equipment the
data taken from the imaging equipment. BioCUT is a
powerful tool that allows scientists, biomedical
designers and healthcare providers to create complex
tissue structures in a seamless way integrated
into the digital workflow.



laboratory dotted with 3D BioPlotters EnvisionTec

3D Printers that will be used in EMERALD Project - University POLITEHNICA of Bucharest



Hybrid 3D Printer Zmorph 2.0 SX Full SET
- FDM (Fused Deposition Modeling)

Photocentric Liquid Crystal
- DLP (Digital Light Processing)

Phenix Systems – PXS&PXM
- DMLS (Direct Metal Laser Sintering) – collaborating company

HUMAN RESOURCES - UPB

University POLITEHNICA of Bucharest team of the EMERALD project

Researchers

- Dean Prof.Habil.Dr.Eng. DOICIN Cristian
Faculty IIR

- Director Doctoral School – Faculty IIR
Prof.Habil.Dr.Eng. IONESCU Nicolae

- Vice-Dean Assoc.Prof.Dr.Eng. ULMEANU Mihaela-Elena
Faculty IIR

- Head Dep.Prof.Dr.Eng. SAVU Tom
Dep Manufacturing Engineering -IIR

- Head Dep.Prof.Dr.Eng. ZAHARIA Cătălin
Dep Bioresources and Polymer Science

- Assoc.Prof.Dr.Eng. GHIONEA Gabriel -Ionuț - Faculty IIR

- Lect.Dr.Eng. Radu Ionuț-Cristian
Dep Bioresources and Polymer Science

- Drd.Eng. JUGRAVU Bogdan-Alexandru
Faculty IIR

Management and Implementation

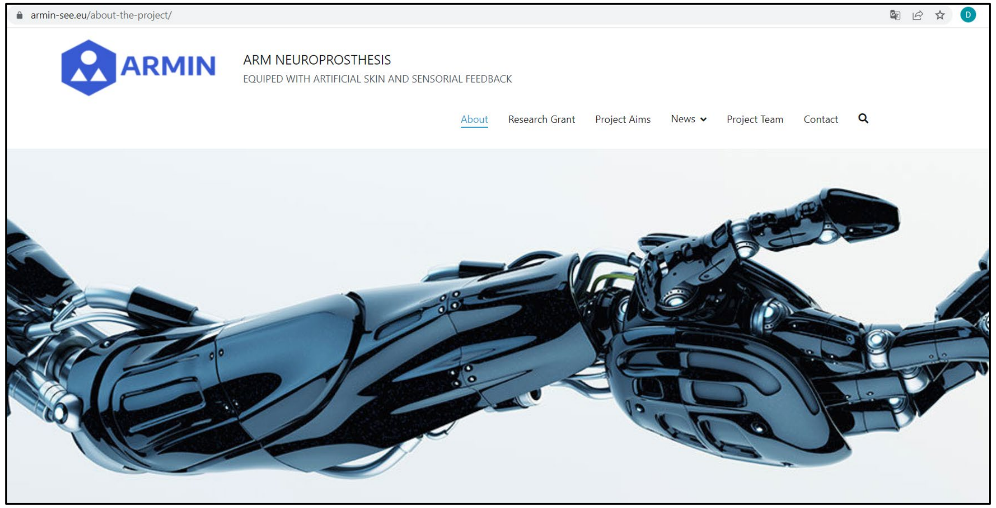
- Assoc.Prof.Dr.Eng. BĂILĂ Diana-Irinel – Manager
Faculty IIR

- Ec. CĂLDĂRUȘ Florina – Financial Responsible
Rectorat
- Ec. DIACONU Nicoleta - Salary Financial Responsible
Rectorat
- Ec. VÎRJOGHE Mădălina - Responsible for human resources
Rectorat

ARMIN PROJECT DESCRIPTION

University POLITEHNICA of Bucharest has won different research projects within the EEA Grants 2018 competition. One of the most representative grant is EEA-RO-NO-2018-0390, ARM NEUROPROSTHESIS EQUIPED WITH ARTIFICIAL SKIN AND SENSORIAL FEEDBACK - ARMIN (https://armin-see.eu/), coordinated by UPB, which had as partners:

- ✓ the National Institute of Microtechnolgy,
- ✓ Clinical Hospital of Floreasca,
- ✓ Medical Science Academy,
- ✓ Areus Technology,
- ✓ University of South-Eastern Norway,



Budget approx. 1.510.000 euro.
Project Director: Prof.dr.eng. DONȚU Octavian

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 biointerfaces 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.

ARMIN Project – The granular key targets

- ✓ to fabricate the mechanical structure of the neuroprosthesis, equipped with artificial skin;
- ✓ to fabricate the neuroprosthesis control block;
- ✓ to increase the quantity and quality of command neurosignals collected on the stump and the tactile feedback;
- ✓ to design and develop the software implementation of the motion algorithms database;
- ✓ to successfully fabricate the implantable electrodes;
- ✓ to fabricate the fully functional implantable neural interfaces connecting the neuroprosthesis to the peripheral nervous system of the patient stump, including: electronics, bio-printed regenerative bio-interfaces, Wi-Fi module;
- ✓ to experimentally implant the electrodes and neural interfaces into the patient stump;

ARMIN Project – The activities of the project led to the following expected measurable results

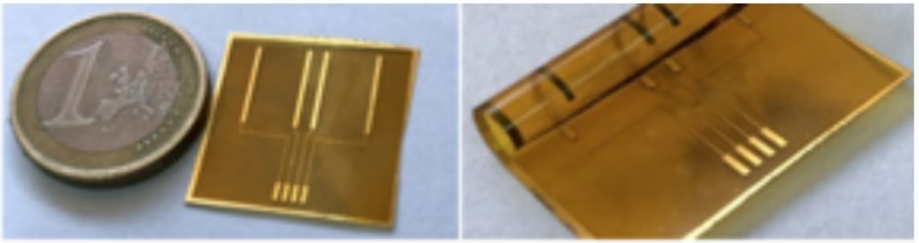
- Mechanical structure of the neuroprosthesis equipped with artificial skin;
- Motor drive block of neuroprosthesis;
- Control system of neuroprosthesis;
- Implantable electrodes;
- Neural motor interfaces for neuroprosthesis' fingers and palm;
- Tactile feedback neural interfaces for neuroprosthesis' fingers;
- Medical and technical methodology for implanting the neural electrodes and interfaces, to bidirectional connect the prosthesis with the peripheral nervous system from the patient stump;
- Study on biocompatible materials for 3D bioprinting in vivo of regenerative neural biointerfaces;
- Regenerative neural sensitive biointerface for separation in the median nerve of the sensitive fascicles for tactile feedback from the fingers 1, 2 and 3 of the neuroprosthesis;
- Regenerative neural sensitive biointerface for separation in the ulnar nerve of the sensitive fascicles F for tactile feedback from the fingers 4, 5 and palm of the neuroprosthesis;
- Experimental implantation in the patient stump of the regenerative neural sensitive biointerfaces, electrodes and neural interfaces for neuronal control and feedback;
- Patient training program for using the neuroprosthesis;
- The neuroprosthesis mounted on the stump and connected with the periferic nervous system of selected patient.
- These results will represent a breakthrough as compared to previous / preliminary work done by various specialist teams involved in such device implementation.

ARMIN Project – Project results (http://viewer.zmags.com/publication/30062023#/30062023/18)

Mechanical structure of the neuroprosthesis equipped with artificial skin

1. software design of the mechanical structure;
2. fabrication of the mechanical structure

Design and fabrication of the implantable electrodes



Kunstig arm styrt av hjernen

En kunstig arm som kan styres av hjernen til eieren. Det er målet for et forskningsprosjekt som vil revolusjonere hverdagen for protesebrukere.

Av Bjørn Ø Andersen

Noen av de norske deltakerne i ARMIN: Fra venstre prosjektleder Lars-Cyril Blystad, student Hanna Borchgrevink, professor Per Øhlckers, førsteamanuensis Mehdi Azadmehr, postdoktor Luca Marchetti og overingeniør Birgitte Kasin Hønsvall, alle fra USN

Personer som er født uten arm eller som må amputere, kan i fremtiden få montert en protese som kontrolleres av hjernen.

EØS-prosjekt

Universitetet i Sørøst-Norge (USN) er partner i et EØS-forskningsprosjekt som skal utvikle en funksjonell, kostnadseffektiv og individuelt tilpasset nevro-håndprotese. Universitetet stiller med seks personer involvert i prosjektet, i tillegg til en Bachelor studentgruppe. De største partnerne kommer fra flere universiteter og institutter i Romania.

– Målet er at protesen skal gi brukeren større bevegelsesfrihet. Implanterte elektroder fanger opp nervesignaler direkte, og brukeren kan dermed ha en detaljert styring av protesen kun ved bruk av hjernen, sier førsteamanuensis Lars-Cyril Blystad ved Institutt for mikrosystemer.

Han er prosjektleder for USNs rolle i det internasjonale forskningsprosjektet kalt «Arm neuroprosthesis equipped with artificial skin and sensorial feedback», forkortet ARMIN. Romania er samarbeidslandet og prosjektet til 15,2 millioner kroner går frem til 2023.

Kanskje noe av det viktigste er at løsningen skal ha så lav kostnad som visse utfordringer med selve protesen/hånden. Men de regnet likevel med at dette skulle bli løst om ikke lenge. Ellers ble det diskutert hvordan man håndterte grensesnittet for å overvåke Velostat; en elektrisk ledende, polymerisk film med innebygde sensorer for trykkfølsomhet og temperatur.

Kunstig hud og sensorer

Mens tradisjonelle arm- og håndproteser ser ut som armer, har de ikke den samme avanserte funksjonen. Målet med det nye forskningsprosjektet er å utvikle en protese som skal fungere mer som en helt vanlig arm med mer presis bevegelseskontroll.

– Proteser som finnes på markedet i dag spenner helt fra knappefunksjoner

ARMIN

Arm neuroprosthesis equipped with artificial skin and sensorial feedback (ARMIN).

Partnere

- Politehnica University of Bucharest, Romania
- Academy of Medical Sciences of Romania, Romania
- Emergency Clinical Hospital of Buchares, Romania
- National Institute for Research and Development in Microtechnologies, Romania

De to første årene jobber forskerne med teknologiutvikling og de to siste går til implantering og testing.

– Protesen skal utstyres med kunstig hud og sensorer som muliggjør en unik toveiskommunikasjon mellom protesen og det perifere nervesystemet i brukerens arm, forteller Blystad. Han legger til at de faktisk har en «perfekt» pilotpasient i Romania.

Studenter bidrar

Et mål er også at nevroprotesen kan sende nervesignaler inn til brukeren via implanterte elektroder, som vil kunne gi en viss følsomhet i håndprotesen.

Studenter inkluderes også i forskningsprosjektet. Phillip Varpe, Hanna Borchgrevink, og Zjewan Amin studerer SMART produktdesign og skal se på mulighetene 3D-printing gir for fremstilling av en funksjonell håndprotese. Det blir også bacheloroppgaven deres.

Oppgaven krever 3D-scanning av en frisk hånd og studentene må vurdere materialvalg og fysisk utforming basert på blant annet slitestyrke, elastisitet, temperaturfølsomhet og pris.

– Det er spennende og lærerikt å få jobbe så tett på et forskningsprosjekt. Vi får et innblikk i hvordan det er å jobbe som forsker og hva som kreves i forskningsprosjekter. Ikke minst får vi brukt kunnskapen vår og alt vi har lært på et ekte prosjekt, som er svært nyttig og bra å ha på CV-en når vi skal ut å søke jobb, sier Hanna.

Kilde: USN/An-Magritt Larsen

Neurale grensesnitt

Prosjektgruppen vil designe implanterbare elektroder for å fange og stimulere neurale signaler. De vil være sirkulære og vil kunne dekke en diameter på 100 mikron ÷ 2 mm. Elektrodene blir implantert rundt spesifikke grener av median-nerven og spesifikke grener av ulnarnerven fra pasientens amputerte stump. Median-nerven gir signal fra hjernen til protesen, mens ulnarnerven mottar signal fra protesen. Kommunikasjon mellom amputert arm og protese vil skje trådløst. I protesen blir det små elektromotorer for bevegelse mens fingre og håndflate har sensorer.

ARMIN Project – Dissemination Results

- Monica Dascalu, David Dragomir, Daniel Besnea, Lidia Dobrescu, Ana Maria Pascalau, Dragos Dobrescu, Eduard Franti, Edgar Moraru, Anca Plavitu, Mechatronic Structure for Forearm Prosthesis with Artificial Skin, In: Yadav S., Singh D., Arora P., Kumar H. https://doi.org/10.1007/978-981-15-2647-3_42 https://link.springer.com/chapter/10.1007/978-981-15-2647-3_42
- Lars-Cyril Blystad, Per Ohlckers, Luca Marchetti, Eduard Franti, Monica Dascalu, Octavian Ionescu, Dragos Dobrescu, Lidia Dobrescu, Catalin Niculae, David Cătălin Dragomir, Birgitte Kasin Hønsvall, Cristian Ovidiu Opris, Kristin Imenes, Marian Ion, Ana Maria Oproiu, Ana-Maria Pascalau, Carmen Moldovan, Bogdan Firtat, Violeta Ristoiu, Roxana Gheorghe, Adrian Barbilian, Bidirectional neuroprosthesis system integration https://ieeexplore.ieee.org/abstract/document/9229697?casa_token=p21mxhf5KD0AAAAA:YmiFxJrHYLh0n_EVbSQdn-YpL7QCmgB09uYIKxuetPAq7-S9g8DUQxvELIOW61tKEspvhqwelEpF
- M. Dascalu, D. Dragomir, D. Besnea, L. Dobrescu, A. M. Pascalau, D. Dobrescu, E. Franti, E. Moraru, A. Plavitu, Mechatronic Structure for Forearm Prosthesis with Artificial Skin, presented at ICMET 2019 http://www.icmet.in/
- http://viewer.zmags.com/publication/30062023#/30062023/18
- https://www.usn.no/aktuelt/nyhetsarkiv/forsker-pa-kunstig-arm-styrt-av-hjernen

EMERALD PROJECT - DIFFERENCES FROM ARMIN PROJECT

- ✓ The consortium formed within the EMERALD project consists of universities from several European countries, and the researchers and students from these universities will collaborate to obtain the research results regarding the manufacture of innovative and cheap biomimetic mechatronic systems. The consortium also has a company from Slovakia that will help the smooth running of the project activities.
- ✓ Certain components of the mechatronic biomimetic systems will be realized through the innovative Additive Manufacturing technologies and there will be courses that will be supported within the project regarding the use of these technologies. As exemple, the University POLITEHNICA of Bucharest will realize the Sensors and Electronics course (Prof.dr.ing. Savu Tom) and the Intelligent Materials course (Prof.dr.ing. Zaharia Cătălin).
- ✓ The University POLITEHNICA of Bucharest will deal with finding different solutions concerning the materials (different technologies DMLS/SLM, different coatings) for developing new biomimetic mechatronic systems.
- ✓ University POLITEHNICA of Bucharest has proposed a new innovative 3D printing technology, Fresh 3D Printing (Freeform Reversible Embedding of Suspended Hydrogels), that used materials that mimic living tissues.
- ✓ Such examples can be integrated a provided in close correlation with the biomimetic mechatronic systems to be made by 3D printing in the future, so this is the reason why contribution in the course module related to the 3D printing and Rapid Tooling methods will be brought by the University POLITEHNICA of Bucharest in cooperation with the Tasks Application Details O2: IO2 - EMERALD e-toolkit manual for digital learning in producing biomimetic mechatronic systems. University POLITEHNICA of Bucharest include Multiplier Event ME1 and the Intellectual Outputs covered is EMERALD e-book for developing of biomimetic mechatronic systems.

EMERALD project – Different results from the ARMIN project

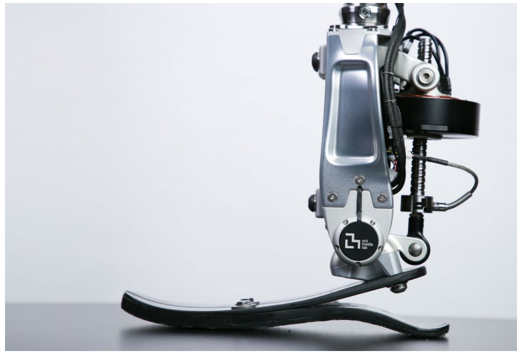
- Submission for publication of **4 articles in ISI journals with high impact factor and high visibility** (Mechatronics, 3D Printing, Biomechatronics, Materials).
- Submission of research papers to participate in **4 international conferences relevant to the Mechatronics/3D printing/VR/AR, biomechatronics.**
- Publishing open access book in the field of mechatronic biomimetic systems made by 3D printing technologies.
- Publishing open access toolkit manual, that will be developed for boosting the digital learning in developing and producing of biomimetic mechatronic systems for people with special needs.
- Submission a patent application.

EMERALD PROJECT - DIFFERENCES FROM ARMIN PROJECT

EMERALD project – Manufacturing of different biomimetic mechatronic systems from the ARMIN project

Proposal biomimetic mechatronic systems for legs to improve

1 - Robot prosthetic ankle



https://emag.medicalexpo.com/revolutionary-robotic-ankle-replicating-natural-human-movement/

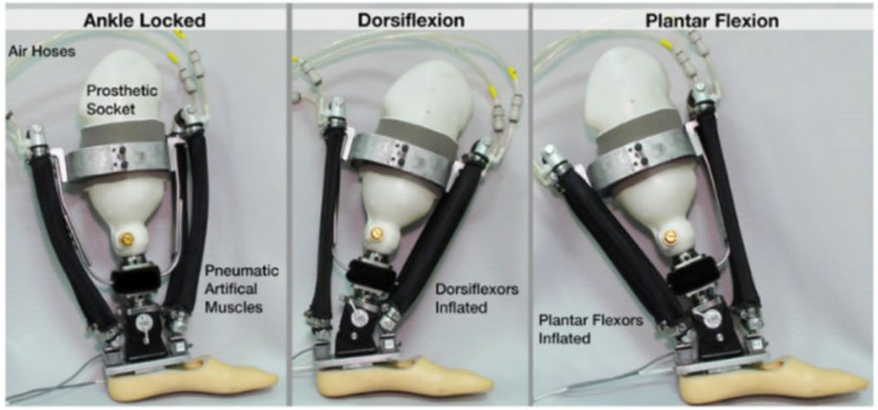
EMERALD PROJECT - DIFFERENCES FROM ARMIN PROJECT

EMERALD project – Manufacturing of different biomimetic mechatronic systems from the ARMIN project

Proposal biomimetic mechatronic systems for legs to improve

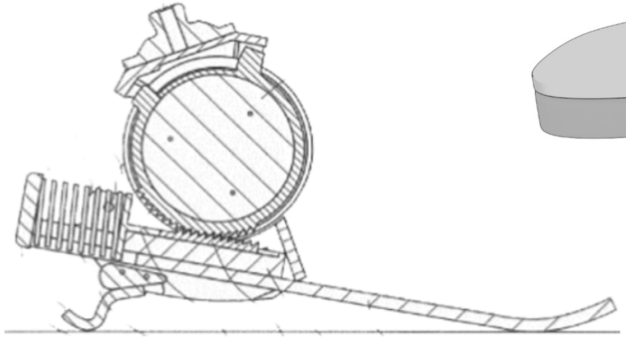
2 - Robot prosthetic ankle

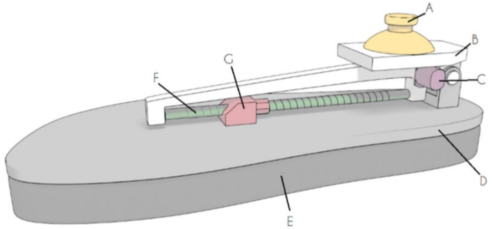
https://www.mdpi.com/2076-3417/11/12/5591

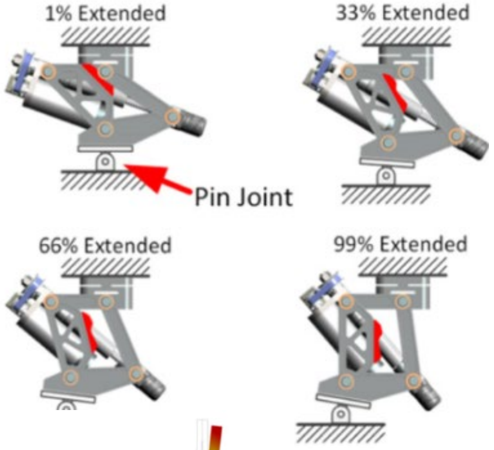


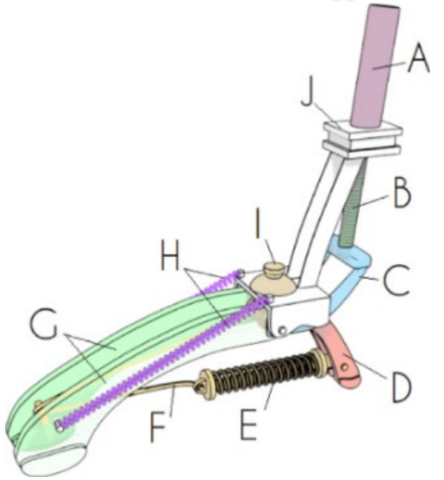
A

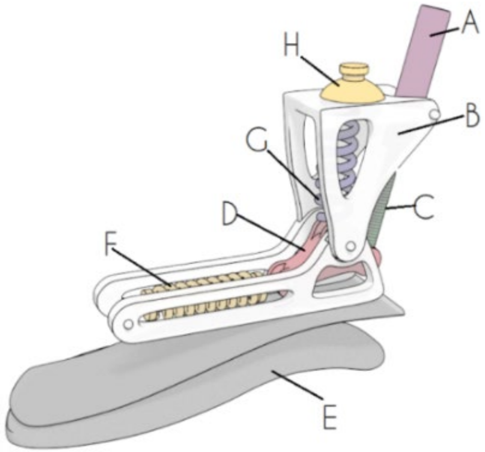

B











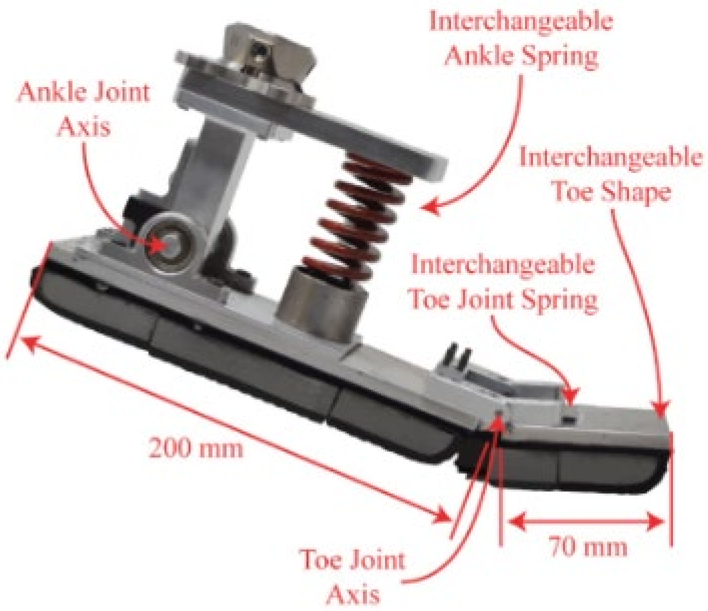

A B C

EMERALD PROJECT - DIFFERENCES FROM ARMIN PROJECT

EMERALD project – Manufacturing of different biomimetic mechatronic systems from the ARMIN project

Proposal biomimetic mechatronic systems for legs to improve

3- Robot prosthetic ankle



4- Microprocesor foot

5- Bionic foot

6- Microprocesor foot

EMERALD PROJECT - DIFFERENCES FROM ARMIN PROJECT

EMERALD project – Manufacturing of different biomimetic mechatronic systems from the ARMIN project

Proposal biomimetic mechatronic systems for legs to improve

Legs orthosis for mobility recuperation





https://www.anatomicalconceptsinc.com/knee-orthoses

https://ibrace.ca/en/best-custom-orthotics/ankle-foot-orthotics/

EMERALD PROJECT - DIFFERENCES FROM ARMIN PROJECT

EMERALD project – Manufacturing of different biomimetic mechatronic systems from the ARMIN project

Proposal biomimetic mechatronic systems for legs to improve

Knee orthosis for mobility recuperation

Elbow orthosis for mobility recuperation

https://www.anatomicalconceptsinc.com/knee-orthoses

https://www.3dnatives.com/en/3d-printed-orthoses-110620194/#!

EMERALD PROJECT - DIFFERENCES FROM ARMIN PROJECT

EMERALD project – Manufacturing of different biomimetic mechatronic systems from the ARMIN project

Proposal biomimetic mechatronic systems for legs to improve

Orthosis legs – 3D Printing

https://3dprint.com/69887/leg-brace-3d-printing/

https://www.3dnatives.com/en/3d-printed-orthoses-110620194/#!

EMERALD PROJECT - DIFFERENCES FROM ARMIN PROJECT

EMERALD project – Manufacturing of different biomimetic mechatronic systems from the ARMIN project

Proposal biomimetic mechatronic systems for legs to improve

Orthosis leg models – 3D Printing

https://www.hindawi.com/journals/abb/2017/9610468/

https://cults3d.com/en/3d-model/various/ortesis

EMERALD PROJECT - DIFFERENCES FROM ARMIN PROJECT

EMERALD project – Manufacturing of different biomimetic mechatronic systems from the ARMIN project

Recommended cheap materials to be used for biomimetic mechatronic systems for legs:

SLS – material PA12
FDM – PEEK, PLA, PLA Silk Rainbow, PLA Silk Like Kingfisher Rainbow Colours (Silicone properties)
DLP, SLA – biocompatible photopolymer resins
DMLS/SLM – Ti6Al4V, superalloy Co-Cr – biocompatible materials

Analysis Test recommended for the materials used for the components:
SEM (Scanning Electron Microscopy)
TEM (Transmission Electron Microscopy)
EDAX (Energy Dispersive X-ray Analysis)
XRD (X-Ray Diffraction)
FTIR (Fourier Transform Infrared Spectroscopy)
RAMAN (Raman Spectroscopy)
AFM (Atomic Force Microscopy)
Contact angle test

Mechanical tests, in vitro analysis in SBF (Simulated Biological Fluid)/in vivo.

EXPERIMENTAL RESEARCHES IN UPB

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WOS:000671401000001 (autor corespondent)

[2] Răzvan Păcurar, Petru Berce, Ovidiu Nemeş, Diana Băilă, Dan Sergiu Stan, Alexandru Oarcea, Florin Popişter, Cristina Miron Borzan, Sven Maricic, Stanislaw Legutko and Ancuţa Păcurar, "Cast Iron Parts Obtained in Ceramic Molds Produced by Binder Jetting 3D Printing—Morphological and Mechanical Characterization", Materials 2021, 14(16), 4502; (Q1/Q2, IF 2020 = 3,623)
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[3] BĂILĂ Diana, Mocioiu Oana, Zaharia Cătălin, Trușcă Roxana, Surdu Adrian, Bunea Mihaela, "Bioactivity of Co-Cr alloy samples sintered by DMLS process and coated with hydroxyapatite obtained by sol-gel method", Rev. Roum. Chim., ISSN: 0035-3930, (IF2015=0,250), vol.60(9), pp.921-930, 2015.
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[4] BĂILĂ Diana, Mocioiu Oana, Zaharia Cătălin, Trușcă Roxana, Surdu Adrian, Bunea Mihaela, "In vitro behavior of sintered compacts of Co-Cr doped with hydroxyapatite for biomedical implants", Journal of Optoelectronics and Advanced Materials, ISSN/eISSN: 1454-4164/ 1841-7132, (IF2015=0,383), vol.17, No.7-8, pp.1210-1218, 2015.
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WOS:000382353400016 (autor corespondent)

[6] BĂILĂ Diana, Doicin Cristian, Cotruț Cosmin, Ulmeanu Mihaela, Ghionea Ionuț, Tarbă Cristian, "Sintering the beaks of the elevator manufactured by Direct Metal Laser Sintering (DMLS) process from Co-Cr alloy", Journal Metalurgija Croatia, ISSN: 0543-5846, vol. 55(4), pp.663-666, 2016.
WOS:000376167100022 (autor corespondent)

[7] Ulmeanu Mihaela, Doicin Cristian, BĂILĂ Diana, Rennie Allan, Neagu Cornel, Laha Shondipon, "Comparative evaluation of optimum additive manufacturing technology to fabricate bespoke medical prototypes of composite materials", Jurnalul de Materiale Plastice, ISSN/eISSN 0025-5289/ 2668-8220, (IF2015=0,903), vol.52, No.3, pp.416-422, 2015.
WOS:000362382300032

[8] O.C. Mocioiu, I. Atkinson, J. Cusu-Pandele, V. Bratan, S. Petrescu, D.I. BĂILĂ, A.M. Mocioiu, „Structural and physico-chemical characterization of Zn-doped SiO2 glasses obtained by sol-gel route", Revue Roumaine de Chimie, ISSN: 0035-3930, (IF2018=0.395), Vol.63, Iss. 5-6, pp. 419-424, 2018.
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EEA projects deposition – UPB and Dep. Manufacturing Engineering TCM

EEA-JRP-RO-NO-2013-1-0096
"Towards a better protection of children against air pollution threats in the urban areas of Romania" – Acronym ROKIDAIR
Partner University POLITEHNICA of Bucharest
Norway Partner:
Norwegian Institute for Air Research –NILU

EEA-JRP-RO-NO-2013-1-0080
"Air quality, pollutants and health risk in the machine building industry in region of South East and North of Europe" – Acronym AIRPOL
Promoter University POLITEHNICA of Bucharest
Norway Partner:
Norwegian Institute for Air Research –NILU

EEA-JRP-RO-NO-2013-1-0311
"Technology for disassembly, recovery and reuse of subassemblies, components and materials in the aerospace industry in region of South East and North Europe"
Promoter University POLITEHNICA of Bucharest
Norway Partner:
The Artic University of Norway

EEA-RO-NO-2018-0115
"ONCOLOGY MEETS ENGINEERING: MODULATION OF CANCER BIOLOGY ON CHIPS"
Promoter: University POLITEHNICA of Bucharest
Partner: SINTEF Norway

EMERALD PROJECT - RESEARCH DIRECTIONS

This project will lead to the opening of new topics and research directions that will be capitalized in projects such as:

- HORIZON 2020
- CORDIS EU
- EEA GRANTS
- EUROSTARS (EUREKA)
- TEMPUSV
- ERASMUS-MUNDUS ACTION3, etc.