TECHNICAL UNIVERSITY
OF CLUJ-NAPOCA
ROMANIA

Faculty of Production Engineering and Robotics

www.cm.utcluj.ro

TECHNICAL UNIVERSITY OF CLUJ-NAPOCA ROMANIA

Promotion Guide

The purpose of this promotion guide is to provide you with up-to-date information related to the Faculty of Production Engineering and Robotics at the Technical University of Cluj-Napoca (TUCN).

This document is making no claim to be exhaustive but it is presenting the overall research and innovation activities at the Institute and its most significant achievements.

This Promotion Guide about the Faculty of Production Engineering and Robotics at TUCN has been prepared in the framework of the AMaTUC project funded by the European Union's Horizon 2020 research and innovation Programme (Grant Agreement No 691787).

AMaTUC European project on Additive Manufacturing

Message from the Dean of the Faculty

Prof. Nicolae Balc

With over 2,700 students and 130 academic staff, the Faculty of Production Engineering and Robotics (PER) has an important role in Transylvania, in engineering education, scientific research and co-operation with industrial companies. Faculty of PER has a long tradition, with over 60 years of experience and a strong expertise in engineering education and research. There is a modern and long term vision, to be in line with the high level technological developments of European industrial companies.

There are experienced academic staff, who have cooperated with European universities and had work contracts for teaching and research abroad, within western universities. The research laboratories have modern equipment, mainly in the field of Additive Manufacturing, CNC machining, Metal forming, Robotics, Quality Management, Reverse Engineering, Advanced Mechanics, Micro and Nano systems, Virtual Reality, etc.

Research partners from international organisations are welcomed to cooperate with the research groups from the Faculty, in different fields explored within the Faculty's laboratories and for interdisciplinary research topics.

Previous and on-going research projects are presented in this promotional guide, in order to offer relevant information regarding the research directions, facilities and activities of the Faculty, so that new partnerships could be established within the HORIZON 2020 Programme, with researchers from European and international academic institutions and/or industrial companies.

Industrial companies are welcomed to cooperate with academic and Faculty's research staff, in order to get consultancy, external evaluation of new products, new technologies and to take benefits from the strong expertise and services available on product design, manufacturing, management and robotics.

I hope that the international students, academic staff and representatives from the industry will have a fruitful cooperation with our Faculty's research groups!

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FACULTATEA DE CONSTRUCȚII DE MAȘINI

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The University

The Technical University of Cluj-Napoca is classified by the Ministry of Education as an "Advanced Research and Education University". The Technical University of Cluj-Napoca was founded, based on the older Industrial College (1920) which has been reformed and restructured several times during its history.

Today, the Technical University has over 20,000 students throughout 13 faculties mainly located in Cluj-Napoca (9) but also in Baia-Mare (4). TUCN also has a regional coverage of the north-west part of Romania with local branches in Alba-Iulia, Bistrita, Satu-Mare and Zalau.

- Faculty of Architecture and Urban Planning
- Faculty of Automation and Computer Science
- Faculty of Civil Engineering
- Faculty of Production Engineering and Robotics
- Faculty of Electronics, Telecommunications and Information Technology
- Faculty of Materials and Environmental Engineering
- Faculty of Electrical Engineering
- Faculty of Building Services
- Faculty of Mechanical Engineering
- Faculty of Engineering
- Faculty of Humanities
- Faculty of Sciences

In addition to its educational mission, TUCN is also highly involved in research and innovation activities and has developed over the years, strong relationships with international universities and research centres as well as European industry actors. Research is conducted at department level, predominantly in over 70 accredited research structures. The new research strategy aims at creating self-sustainable interdisciplinary and multidisciplinary structures capable of outstanding scientific achievements, integrated within a multidisciplinary research institute.

The Faculty

FACULTATEA DE CONSTRUCȚII DE MAȘINI

The Faculty of Production Engineering and Robotics (PER) is successful from both scientifically and educational points of view and has good cooperation with companies. It is a dynamic Faculty in the field of industrial engineering, robotics and industrial management. The Faculty has over 130 academic staff, providing education at bachelor, master and doctorate level.

The mission of the Faculty of PER is to educate good specialists, which should be able to sort out tasks related to product design, manufacturing and management, in the field of industrial engineering and robotics. The scientific research represents a very important segment of the activities at the Faculty: with 8 research centres and 6 accredited research laboratories. New valuable knowledge is produced thanks to European research funding and national grants, and the results are published in highly ranked journals. The Faculty has an active role in co-operation with industrial companies, by offering consultancy and providing services on commercial basis.

The objectives of the Faculty are i) to improve the competences of the graduates, in a better correlation with the demands from the engineering labour market, ii) to provide more practical abilities to our students on top of theoretical knowledge and iii) to transfer more and more technologies from the research laboratories to the companies.

More than 2,700 students are enrolled within the Faculty of PER, within 16 bachelor programmes and 14 master programmes. The Faculty has a regional development, with branches in other 4 big cities (Alba-Iulia, Bistrita, Satu-Mare and Zalau), besides the main location in Cluj-Napoca. About 40% of the students are studying within these 4 external locations of the Faculty, where regional authorities are supporting the Faculty, in order to provide a good engineering education to the employees of local industries.

The Faculty

The Faculty of PER provides students with bachelor programmes in the following domains :

- "Manufacturing Engineering", taught in 3 languages (Romanian, English and German). The programme takes place in Cluj-Napoca but also in Alba-Iulia, Satu-Mare and Zalau;
    - "Product Design programme", located in Cluj-Napoca;
    - "Machine Tools and Production Systems", located in Bistrița
    - "Industrial Economical Engineering", taught in 2 languages (Romanian and English) and located in Cluj-Napoca, Alba-Iulia, Bistrița and Satu-Mare;
    - "Robotics", given in 2 languages (Romanian and English) and located in Cluj-Napoca and Bistrița;

The Faculty also has 14 master programmes located in Cluj-Napoca. Some of them are taught in several languages, including Romanian, English or German. As mentioned before, the Faculty of PER is largely involved in different research and innovation activities and initiatives. The main research directions of the Faculty are:

- Additive manufacturing;
- Advanced manufacturing technologies;
- Non-conventional and innovative technologies;
- Metal forming;
- Simulations and testing for industrial robots;
- Micro and nano systems;
- Advanced mechanics, Innovation management and quality management in industrial engineering;
- Digital production and virtual reality.

In order to provide qualitative educational programmes to students and perform state-of-the-art research, the Faculty has divided its activities in departments we will present later on in this Promotional Guide.

For more information, please visit the website of the of the Faculty of Production Engineering and Robotics.

RDI projects

The scientists at the Faculty of PER are all involved in different Research, technological Development and Innovation (RDI) projects in the various field of expertise covered by the five departments. In this section, we will present you a sample of RDI projects implemented at the Faculty, from research to innovation, from national to international, with academic and/or industrial partners.

Boosting the scientific excellence and innovation capacity in additive manufacturing of TUCN

- ***Funding Source***: European Commission's Horizon 2020 Programme
- ***Dates***: January 2016 - December 2018
- ***Website***: www.amatuc.com

The 3-year project will build upon the existing strong research and innovation base of TUCN and its twinning partners Loughborough University (UK), FH Aachen University of Applied Sciences (Germany) and Intelligentsia Consultants (Luxembourg). The AMaTUC project will focus on sub-topics relevant to AM with a high socioeconomic impact for European and Romanian markets.

The three project's sub-topics are the following:

- Improve existing AM technologies,
- Integrate the AM technologies with suitable Rapid Tooling methods,
- Design for competitive manufacturing of personalised products and computer planning (CAEFEM) analysis and simulations.

Knowledge Transfer Community to bridge the gap between research, innovation and business creation

❖***Funding Source***: European Commission's FP7 Programme

❖***Dates***: September 2013 – August 2016

❖***Website***: www.no-gap.eu

NoGAP bridges the gap between research and innovation and contributes to taking advantage of the innovation potential of SMEs based on a better cooperation with researchers, transferring and using knowledge resulting from research. The overall objective of the project is to reinforce cooperation with Eastern Partnership countries to develop a "Common Knowledge and Innovation Space" on societal challenge "secure, clean and efficient energy".

The NoGAP consortium is composed of 13 organisations from 6 countries of which 3 are EU members (Germany, Romania, Slovakia) and 3 are members of the Eastern Partnership (Belarus, Ukraine, Georgia).

3SMVIB 3-Scale modelling for robust-design of vibrating micro sensors

❖***Funding Source***: European Commission's FP7 Programme

❖***Dates***: September 2012 – December 2015

❖***Website***: www.imt.ro/3SMVIB/

This project aims at improving the efficiency of the manufacturing process while decreasing the production cost by considering at the design stage the uncertainties in such a way that a range of the MEMS properties can be predicted for the manufactured products. Such a non-deterministic approach can be achieved after introducing the following new achievements as targeted innovation.

- ❖ Development of original micro-meso-macro stochastic finite element methods
- ❖ Database collection of uncertainties for given MEMS devices
- ❖ Validation by extensive measurements on produced vibrating micro-sensors
- ❖ Evaluation of development/manufacturing/exploitation cost reduction

English as the cornerstone of sustainable technology and research

❖***Funding Source***: European Union's TEMPUS IV Programme

❖***Dates***: November 2013 – March 2017

❖***Website***: http://tempus-ecostar.iucc.ac.il

The project is a joint cooperation of 6 European universities from the UK, Italy, Poland, Netherlands, Cyprus and Romania, with 8 higher education institutions from Israel, coordinated by ORT Braude College of Engineering-Karmiel-Israel. The project's objectives:
1/ To develop a new framework for English teaching in Israeli colleges and universities aligned to the Common European Framework of Reference (CEFR); 2/ To develop a framework for good practice in English as a Medium of Instruction (EMI) in higher education; 3/ To design and implement an open educational repository of language teaching and learning resources for each level of competence on a fully functional moodle.

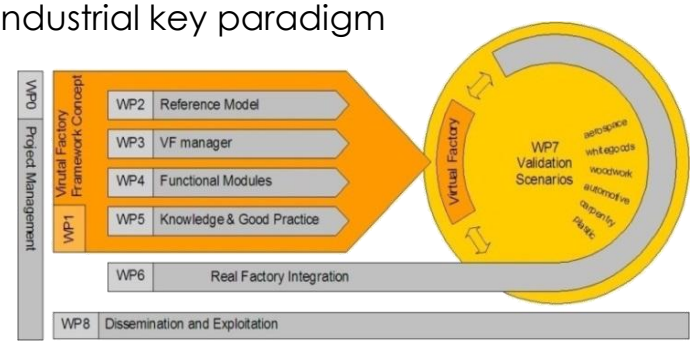
Holistic, extensible, scalable and standard Virtual Factory Framework (VFF)

❖***Funding Source***: European Commission's FP7 Programme

❖***Dates***: September 2009 – February 2013

❖***Website***: www.vff-project.eu

The project objective is to foster and strengthen the primacy of Future European Manufacturing by defining the next generation VFF. The VFF will promote major time and cost savings while increasing performance in the design, management, evaluation and reconfiguration of new or existing facilities. This approach identifies four key Pillars: 1/ a Reference Model for factory planning, based on the new industrial key paradigm "Factory as a Product"; 2/ the VF Manager core; 3/ a set of decoupled Functional Modules for supporting the factory design and management and 4/ the Integration of Knowledge at different layers.



InnoCap Transylvania

Services to enhance the innovation management capacity of SMEs in the macro-region 1 in Romania

❖***Funding Source***: European Commission's H2020 Programme

❖***Dates***: January 2015 – December 2016

The objectives of this project are the following: Increase efficiency and effectiveness of innovation processes of local beneficiaries of SME instrument and SMEs with significant innovation activities and high potential for internationalisation; Facilitate SME's access to consulting services for innovation management to address bottlenecks to creation of economic impact; Support innovative SME's to raise the company's profitability and competitiveness on international markets.

Services BISNet Transylvania - Support for Business and Innovation Network in Transylvania

❖***Funding Source***: European Commission's COSME Programme

❖***Dates***:: 2014 – 2016

❖***Website***: www.bisnet-transylvania.ro

General objective of the project is to increase the competitiveness and the innovation capacity of the European Union, efficiently meeting SMEs and other actors needs by providing integrated business and innovation services as defined at present time and developed within the next years by the new European network (EEN), in RO1 geographical area, through the proposed consortium as network partners.

AM-CIR

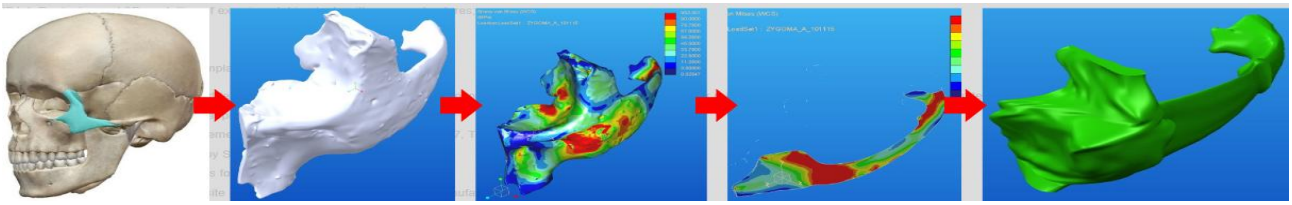
Research on customised implants manufacturing by using AM from composite materials reinforced with metallic structures

❖***Funding Source***: National funding Programme UEFISCDI

❖***Dates***: October 2015 – September 2017

❖***Website***: www.amcir.utcluj.ro

The project presents the design and manufacturing of customised implants from biocomposite materials reinforced with metallic structures. The novelty consists in the development of a customised implant obtained by combining reinforcements made by material addition (Additive Manufacturing technology), with uncontrolled/controlled (lattice type) porous metallic structure, and applying a new viscous polymeric biocomposite by injection.



MEMSMAT

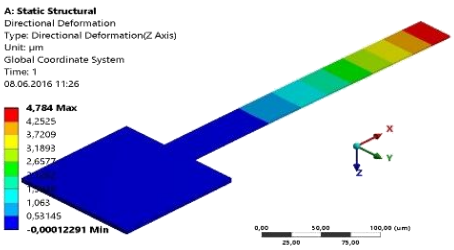
Tribomechanical characterization of MEMS materials for space applications under harsh environments

❖***Funding Source***: Romanian Space Agency

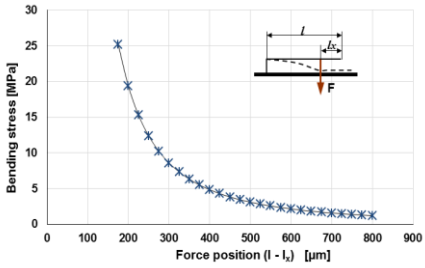
❖***Dates***: December 2013 – December 2016

❖***Website***: http://minas.utcluj.ro/Project-STAR_2

The accuracy detection, the reliability and the lifetime of MEMS are crucial parameters in space applications and these are strongly influenced by the material properties. In this project theoretical analysis, simulations and experimental validations will be performed in order to analyze the effect of environmental conditions on MEMS material properties and on MEMS structures behavior from space applications. NASA space missions require reliability and quality standards. For MEMS field (relatively new technology for space applications), standards do not currently exist. This field is still lacking a heritage database.



FE analysis of the cantilever deflection



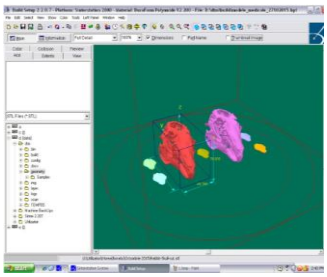
Experimental variations of stresses as function of force positions (l – lx) on 805 µm length sample

PECIFCO Personalised Craniofacial Implants made by innovative 3D printing, from fibre reinforced polymers

❖***Funding Source***: National funding Programme UEFISCDI

❖***Dates***: 2014 – 2017

The goal of the project is to develop a new type of composite biomaterial reinforced with glass fibres, which will be used for the reconstruction of bicortical cranial bone defects. New type of customized medical implants will assure the perfect shape by copying all the features of the master model realized by rapid prototyping methods, with affordable costs for the local health care system. A large number of patients will directly benefit from the new material and technology developed within this research project.

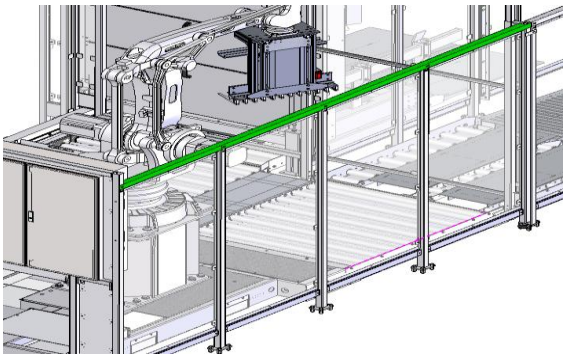


Smart_Fence: Innovative design of the security fences for fast assembly and instalation

❖***Funding Source***: Industry (CSi Industries B.V. Holland)

❖***Dates***: 2015 – 2016

The project aims to redesign the security robotic cell fences produced by CSi for fast assembly and rapid plant installation.



CSI_Apps: Design and development of a package of mobile Apps for quality reporting, product improvement and safety

❖***Funding Source***: Industry (CSi Industries B.V. Holland)

❖***Dates***: 2016 – 2017

This new project with the client CSI aimed at designing and developing a package of mobile Apps for quality reporting, The work also includes features dedicated to product improvement and safety interventions.

International Cooperation

Academic partners

IRCCYN

CMRDI

JOANNEUM RESEARCH

UNIVERSITY OF WARSAW

universität innsbruck

Univerza v Mariboru

Universität Stuttgart

Leibniz Universität Hannover

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

אוניברסיטת בן-גוריון בנגב
Ben-Gurion University of the Negev

RUHR UNIVERSITÄT BOCHUM RUB

FH AACHEN UNIVERSITY OF APPLIED SCIENCES

Technische Universität Braunschweig

Loughborough University

RWTH AACHEN UNIVERSITY

HAMK HÄMEEN AMMATTIKORKEAKOULU HÄME UNIVERSITY OF APPLIED SCIENCES

КарМУ

K L UNIVERSITY

MISKOLCI EGYETEM UNIVERSITY OF MISKOLC

УРАЛЬСКИЙ ФЕДЕРАЛЬНЫЙ УНИВЕРСИТЕТ имени первого Президента России Б. Н. Ельцина

International Cooperation

Industrial partners

KODEWA

ACAROM
ASOCIATIA CONSTRUCTORILOR DE AUTOMOBILE DIN ROMANIA

ROMANIA PLASTOR

MICHELIN
Mereu Inainte

güHring GMBH SPANNTECHNIK

STC

FIBREX

EMERSON

RENAULT

B&R

Rexroth
Bosch Group

ThalesAlenia Space
A Thales / Finmeccanica Company

force dimension

DESTACO
A DOVER COMPANY

International conferences

Modern Technologies in Manufacturing

MTeM 2015

www.mtem.utcluj.ro

MTeM is a biennial international conference organised by the Department of Manufacturing Engineering, where the main objective of the conference is to offer the frame of a higher-level academic meeting allowing a fruitful exchange of information and expertise in the field of machine-tools and manufacturing techniques. The organisers also strongly encouraged the young researchers and PhD students to participate. The conference topics included:

- ❖Manufacturing Engineering
- ❖Automation of Manufacturing Systems and Assembly
- ❖Machining processes and Quality assurance
- ❖Metal Forming
- ❖Additive Manufacturing and non-traditional technologies
- ❖CAD-CAM
- ❖Processes of plastics and composite materials
- ❖Environmental Engineering.

Quality and Innovation in Engineering and Management

4th QIEM 2016

The International Conference "Quality and Innovation in Engineering and Management" is organised by the Department of Computer Aided Design Engineering and Robotics at the faculty of PER. The conference intends to take advantage of combining two scientific events coming from emergent and complementary domains in order to stimulate the exchange of valuable opinions and contributions.

The event is bringing worldwide prestigious scientists and young talented researchers, as well as representatives of the industry and other stakeholders.

http://icpr-aem.com

International conferences

Conference on Mechanics of Solids, Acoustics and Vibrations

http://icmsav.utcluj.ro

The International "Conference on Mechanics of Solids, Acoustics and Vibrations" was organised by the Department of Mechanical System Engineering under the coordination of ASTR (Academy of Technical Sciences of Romania), together with UTCN (Technical University of Cluj-Napoca) by DISM (Department of Mechanical Systems Engineering) and Romanian Society of Acoustics and Vibrations. The conference is focusing on the following research topics:

- ❖Mechanics of Solids
- ❖Mathematical Modelling and Calculus Methods
- ❖Advanced Mechanics in Robotics
- ❖Tribology and Micro-Nano Systems
- ❖Optimal Design of the Mechanical Systems
- ❖Acoustics systems of road, air and rail
- ❖Vibrations of structural systems
- ❖Mechanical vibrations of technological equipment
- ❖Isolation and dissipation systems for buildings, bridges and viaducts.

Advanced Engineering in Mechanical Systems

The International Conference on Advanced Engineering in Mechanical Systems is organised by the Department of Mechanical System Engineering and is a biannual high-level ranking international conference in the promotion of the new research in Applied Mechanics and Mechanical System Engineering.

It serves as a forum to disseminate the most recent and relevant information and innovations in all the fields of mechanical engineering. The conference presents the latest research results in the field.

The 4th International Conference
ADEMS'13
Advanced Engineering in Mechanical Systems 2013

www.adems.utcluj.ro

Research departments

In this section, we will outline the scientific activities and research focus of each of the five departments at the Faculty of Production Engineering and Robotics (PER):

- ***Manufacturing Engineering***
- ***Computer Aided Design Engineering and Robotics***
- ***Management and Economic Engineering***
- ***Mechanical System Engineering***
- ***Modern languages and Communication***

Manufacturing Engineering

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Adrian Trif is the Head of Manufacturing Engineering Department since 2016. His courses, seminars and laboratory works include topics relevant to: cutting tools design, Data base, Wood cutting tools, Logistics. He is the editor of "Academic Journal of Manufacturing Engineering" and "Acta Technica Napocensis, Series Applied Mathematics and Mechanics". He has authored/co-authored 36 scientific papers, 1 book and is a member of 17 national/international research contracts.

Description of the department

Teaching and research are the main activities at the Department of manufacturing Engineering (DME). Teaching is provided at all 3 levels: bachelor, master and PhD studies. Manufacturing Engineering teaching program is offered by DME in 3 languages - Romanian, English and German - and located in cluj-Napoca, Alba-Iulia, Satu-Mare and Zalau.

The main research directions within DME are as follows:

- Additive Manufacturing with industrial/medical applications,
- Advanced Manufacturing Technologies,
- Metal forming,
- Composite materials,
- CNC manufacturing,
- CNC Programming,
- Computer Aided Process Planning,
- Finite element analysis,
- Non-traditional and innovative manufacturing,
- Quality management,
- Tools design,
- Flexible manufacturing,
- Design for manufacturing and assembly,
- Etc.

Besides teaching and scientific research, the academic staffs from DME are actively involved in cooperation with industrial companies, by providing consultancy and services to optimize the manufacturing technologies and for Rapid Product development. The cooperation with companies is done also for practical training of the students and to get feedback on the actual needs of the label market, in order to improve the curriculum of teaching programs organized by DME

Research Facilities

WJC equipment - OMAX 2626

MCP Realizer SLM 250

IC equipment - Indutherm VC 1000D

CNC turning equipment – Doosan Lynx 220

Other equipment available:

- SLS - DTM Sinterstation 2000
- EDM Wire Cutting Equipment, SP-640P
- Equipment for mechanical tests - Zwick/Roell Z150
- Hydraulic press - Benedetti HPS 100
- CNC centre (5 axes) - DMU 50 ECO
- CNC machining centre, with 3 axes - Haas TM1
- CNC machining centre, with 3 axes - DMC 63 V

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Computer Aided Design Engineering and Robotics

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Professor Claudiu Ratiu is the Director of the Department of Computer Aided Design Engineering and Robotics. He holds a doctorate in the field of hydraulic machinery and equipment and is also the coordinator of the 'Industrial Design' educational program for bachelor and master students. His research and innovation interests cover the following topics: Proportional hydraulics, electronic controllers and sensors domain-specific adaptive, Appliances for water management with application in industry and agriculture.

Description of the department

The Department aims to create a stimulating environment based on a high quality curriculum, teaching and support methodologies which lead to 1/ a high level of training offer value; 2/a periodic evaluation of the needs and expectations of the labour market; 3/ a correlation between the curricula and required skills by the labour market; 4/ ensuring high vocational trainings; 5/ increasing the academic cooperation with similar institutions from the country and abroad.

The research directions of the department of Computer Aided Design Engineering and Robotics are described below:

- Design and implementation of manufacturing equipment and logistics;
- Design of flexible manufacturing systems;
- Design in the field of numerical controls machines and robots;
- Design and analysis in the field of electro-hydro-pneumatic equipments;
- Management and Quality engineering;
- Engineering and innovation management;
- Robotic manufacturing systems and management;
- Industrial design;
- Computer aided design (CAD / CAM / CIM elements of virtual reality).

Research Facilities

ABB IRB 1600 industrial robot

Robostar SCARA type industrial robot

Motoman SDA10D industrial robot

KR 5 sixx R850 industrial robot

ABB IRB 1600 industrial robot

Other equipment available:

- ❖MAS-200 system- Modular Assembly system
- ❖ Robotic Assembling system: ABB IRB 140 industrial robot

Publications

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Management and Economic Engineering

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Florin Lungu is the head of the Management and Economic Engineering Department at TUCN. He obtained his doctorate in 2005 in Industrial Engineering and has authored/co-authored 12 books and 102 scientific papers and publications. His courses, seminars, laboratory work and projects focused on disciplines in: Industrial management, Engineering Production Systems, Organization of production systems, Fundamentals of computer aided design, Operations management, Optimizing the operations of production systems and Qualitative analysis.

Description of the department

The Department of Management and Economic Engineering (MIE) is part of the Faculty of Production Engineering and Robotics, within the TUCN. The MIE Department offers programs of Bachelor level studies in the "Industrial Economic Engineering" specialization (23 years of graduates, the first one graduating in 1995) in Cluj-Napoca, Alba-Iulia, Bistrita and Satu Mare, Master level study programs in the "Engineering and Management" domain (Engineering and Management of the Sustainable Enterprise, Entrepreneurship, Management and Engineering in Business, Property Valuation and Management of Supply Chain Systems), as well as continuous education programs in the managerial field. There are four Ph.D. coordinators in the department in the "Engineering and Management" domain, which generated 77 Ph.D. titles in the "industrial engineering" and "engineering and management" domains.

Our department's mission is the promotion and implementation of academic professional education programs, of scientific research programs, of national and international interuniversity cooperation with governmental and non-governmental organizations, with other institutions / companies, first of all in the interest of the national economy and academic educational system, aiming the latest technologies according to the current trends at European / global level.

The department includes 22 teachers: 5 Professors, 6 Associate Professors, 10 Lecturers and one Assistant Lecturer on determined period.

Research Facilities

The department's members' research activity falls in a large field of areas of interest, due to the multidisciplinary character of the teachers' training.

Therefore, department's members' **main research directions** are: General and strategic management; Marketing, market research; Capital market Flexible manufacturing systems; Management of manufacturing operations and services; Complex systems' optimization through simulation Economic analysis of production systems; Information systems design; Managerial communication; Human resources; Ergonomic design of systems and products Entrepreneurship Design and analysis of supply chain management systems; Ecomanagement, sustainable development.

In 2010, the **Research Centre in Management for Organisational Sustainability** has been created within the Department of Management and Economic Engineering. It has been internally accredited at the level of research structures in the university and where most of the department's teachers are members.

One important possibility of capitalizing the research results consists in publishing articles in **the Review of Management and Economic Engineering** - ISSN (print): 1583-624X, ISSN (online): 2360-2155, which is rated by CNCSIS in the B+ category, indexed in 6 international databases and edited by the Department of Management and Economic Engineering).

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Revista de Management şi Inginerie Economică

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Publications

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Mechanical System Engineering

Prof. Luilui Negrean is the head of the Mechanical System Engineering Department at the Technical University of Cluj-Napoca. His research interests include the following: Applied Mechanics; Robotics, Mechanical Engineering; Mathematical modeling, Kinematic, Dynamic and accuracy behavior of mechanical structures of robots, etc.

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Description of the department

The Mechanical System Department (ISM) was constituted on the 1st October 2011, by merging the Department of Mechanical Engineering and Programming, with the Department of Machine Elements and Tribology.

In the Mechanical Engineering Department, there are courses on computer programming, mechanics, robotics, machine parts, tribology, design, for both of Bachelor and Master accredited specializations of our faculty, as well as the Faculty of Mechanical Engineering, and Faculty of Materials. The Department members continuously contribute to the prestige of the faculty and the university, both nationally and internationally.

- The first group of scientific results refers to new formulations and contributions brought in the field of Applied Mechanics in Robotics and respectively in Advanced Mechanics of multibody systems, as: The Algorithm of Matrix Exponentials in kinematics and dynamics for multibody systems. A fundamental aspect is new formulations regarding the acceleration energy of higher order for multibody mechanical systems; New formulations on differential principles based on acceleration energy of higher order; Establishing of higher order differential equations, concerning the modelling for suddenly movements, respectively the transient motions of mechanical systems.
- The second group of scientific results refers to original contributions in the field of mathematical modeling and simulation of kinematic and dynamic accuracy, in the case of serial robots.

Research Facilities

Atomic Force Microscope XE 70

Stewart-Gough platform for flight simulation

Omega.7 -haptic device

PARA-BRACHYROB

Other equipment available:

- PARAMIS surgical robot
- PARASURG 5M surgical robot
- PARASURG-9M
- Surgical e-platform, consisting of two Omega.7 haptic devices
- a 3D visualization console.
- Testing bed for high power actuation

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Modern Languages and Communication

Monica Ioani is the head of the Modern Languages and Communication Department. She is a member of the AUPELF Association and "Réseaux recherche" AUF: Lexicologie, Terminologie, Traduction. Her domains of interest covers topics such as: Applied linguistics, Techniques of communication, French literature, French for Science and Technology and Romanian as a foreign language.

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Description of the department

The Department offers foreign language courses to all the students of the nine faculties of the Technical University of Cluj-Napoca, as well as communication and professional communication courses. The Department's main aim is to enhance the students' technical and scientific communication skills and their mastery of cognitive and discursive notation and operations specific to the scientific discourse.

The foreign language courses are adapted to the students' major and last for two years. At Bachelor's level they are also offered technical writing courses, lectures for enhancing their communication, interpersonal and group communication skills.

The Master's degree courses and seminars aim at gathering, structuring and processing specialized information in topic-related fields, which are collections of studied articles and scientific reports, conferences and complexly well-argued speeches.

The Department issues language competence certificates for students and alumni of the TUCN, by which they can apply for exams, scholarships, master's or doctoral degrees as well as jobs.

Meet the staff

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Nicolae Balc is Professor within the Department of Mechanical Engineering (DME). He was Director of the DME for 12 years (2004-2016) and he is currently the Dean of the Faculty of Production Engineering and Robotics at TUCN. Over the past years he coordinated 16 research contracts and participated to several R&D projects including European funded projects such as H2020 AMaTUC (coordinator) and FP7 AdM-ERA.

Prof. Balc also coordinated 14 PhD thesis (validated) and has another 6 ongoing PhD research projects. He had work contracts in the UK, as Research Associate at Loughborough University and the University of Nottingham, in the field of Innovative Manufacturing. Overall he published 9 books and more than 150 scientific papers and he has also 7 registered patents (5 national and 2 international patents). He is co-founder of the RAPIMAN European Association and reviewer of the "Rapid Prototyping Journal".

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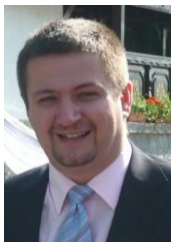

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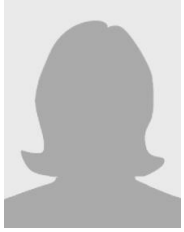

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