



BIM-LCA

Co-funded by the
Erasmus+ Programme
of the European Union



An Innovative Circular
Economy Training based
on BIM
and LCA technologies
applied to the
Construction Industry



Technical University of Cluj-Napoca



ROMANIA FACTS AND FIGURES

Ethnic groups**

Romanian: 89.5%

Hungarian: 7.1%

German: 0.5%

Other ethnic groups 2.9%

Age structure***

0-14 years: 15.52%

15-64 years: 65.25%

65 years +: 19.23%

Religion****

Eastern Orthodox 81.0%

Protestant 5.8%

Roman Catholic 4.3%

Other beliefs 8.9%

Population | aprox. 20 million
Area | (2020)*
230,170 km²

** <https://www.nationsencyclopedia.com/Europe/Romania-ETHNIC-GROUPS.html>

*** <https://www.statista.com/statistics/373125/age-structure-in-romania/>

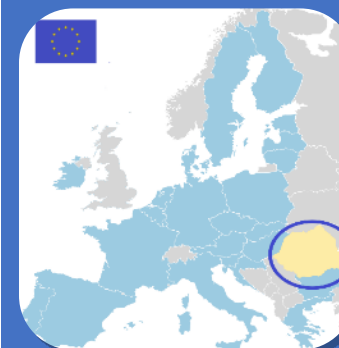
**** <https://www.worldatlas.com/articles/religious-beliefs-in-romania.html>

*<https://www.worldometers.info/demographics/romania-demographics/>



CLUJ-NAPOCA

(Kolozsvar, Klausenburg)



- TECHNICAL UNIVERSITY OF CLUJ-NAPOCA | ROMANIA
- **500.000** inhabitants in the metropolitan area
 - **6** public universities with a total of **80.000** students
 - **Romania's leading** hub of technology & innovations
 - Significant **city's workforce** employed in IT



CLUJ-NAPOCA

CULTURAL CENTERS

- French Cultural Center
- American Cultural Center „J.F. Kennedy”
- British Council Cluj
- Deutsches Kulturzentrum Klausenburg
- Italian Cultural Center
- Japanese Art and Cultural Center
- Confucius Institute
- Korean Cultural Center
- Russian Cultural Centre
- Centre for Polish Language and Culture
- Brazilian Cultural Center *Casa do Brasil*
- Center for African Studies



한국문화원
Korean Cultural Center



CLUJ-NAPOCA

CULTURAL EVENTS

- Cluj-Napoca Days
- Sports Festival
- TIFF - Transylvania International Film Festival
- Jazz in the Park Festival
- UNTOLD
- ELECTRIC CASTLE
- Cluj Musical Autumn





STATE UNIVERSITIES IN CLUJ-NAPOCA

Babes Bolyai University

THE TECHNICAL UNIVERSITY OF CLUJ-NAPOCA

Iuliu Hațieganu University of **Medicine and Pharmacy**

University of **Agriculture Science and Veterinary Medicine**

Gheorghe Dima Academy of **Music**

Ion Andreescu Academy of **Visual Arts**



HISTORICAL BACKGROUND

TECHNICAL UNIVERSITY OF CLUJ-NAPOCA



- 1920 *Industrial College* established in Cluj-Napoca
- 1948 *Mechanical Institute* is being established
- 1953 The college is renamed as *Polytechnic Institute*
- 1992 The institute is renamed as *Technical University (TUCN)*
- 2012 *TUCN merge* with the *North University Baia Mare*



TUCN'S STRENGTHS

Regional dimension

TUCN is recognized as a highly qualified human resource provider for the Northwest region of Romania through its 2 main campuses and 4 subsidiaries, providing multiple links within the regional innovation and entrepreneurship ecosystem for a connected social and inclusive HE system.

Innovation and research

TUCN is on the second position in terms funds attracted through the Horizon 2020 program, among the 48 state universities from Romania.

Trust and reliability

In 2018 the Romanian Agency for Quality Assurance in Higher Education, awarded the institution with the "Highest Degree of Trust in HE". In 2019 TUCN received the status of international university of excellence (4 stars), following the external audit conducted by QS Stars Rating System (UK).





FACULTIES

The Technical University has 12 faculties grouped in two university centers, Cluj-Napoca and Baia Mare, plus the extensions to major cities of the region. The study programs are conducted in Romanian, but also in international languages, respectively English, German and French.

CLUJ-NAPOCA

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



BAIA MARE

- Faculty of Engineering
- Faculty of Humanities
- Faculty of Sciences

SUBSIDIARIES

- Alba Iulia
- Bistrița
- Satu Mare
- Zalău





CULTURAL CLUBS



In Cluj-Napoca and Baia Mare

Românașul student folk ensemble

Gaudeamus student theatre (classic, experimental, musical, revue)

Brigada **BUM** comedy group
Honoris music group

Infinet Skills dance ensemble

Nova modern and social dance group

Observer folk cenacle of interpretation and idea sharing

Pasărea Ibis folk group

Nord student folk ensemble

Students ensemble of traditional Romanian dances

Vocal group of traditional Romanian music

Sf. Ioan Damaschinul Men's Choir

The vocal group of the **Ep. Dr. Alexandru Rusu** seminary



STUDENT ORGANISATIONS



Organizația Studenților din Universitatea Tehnică Cluj-Napoca

www.osut.org



Board of European Students of Technology Cluj-Napoca

www.bestcj.ro



- League of Students of the Technical University of Cluj-Napoca - facebook.com/LSUTCN
- AStA Association of Students of Architecture
- OSSIMM Organization of Students of Materials and Environment Engineering
- ASFIC Association of Students of the Faculty of Building Services Engineering
- ASIEM Association of Students of Economic Engineering and Management
- ASCUT | ESN | EUROAVIA
- Liga Studenților "Pintea Viteazul" - www.lspv.ro



CURRENT MAIN ACTIONS

Digital education

Development of digital skills, as well as the promotion and widespread use of educational technologies into a way that facilitates collaborative learning, multi-campus education and broadens the international reach.

Internationalization

Strengthen the international dimension to generate sustainable partnerships and increase cross-border exchanges of academics, students, administrative staff and knowledge in education, research, innovation and artistic creation, while promoting the European common values and spirit.

Research development

Stimulating an open, collaborative, critical and committed institutional environment for all types of research in "multidisciplinary key areas", through encouraging the members of the university to broaden their perspective and bring new innovative ideas in close collaboration with national/international partners from academia, industry and the public sector.





TUCN KEY FIGURES

20.000+ full time students (Bachelor/Master/PhD)

900+ academic staff

750+ non-academic staff

180+ study programs (Bachelor/Master/PhD)

12 faculties and 36 academic departments

80+ research units

2 main campuses
(Cluj-Napoca
and Baia Mare)

4 subsidiaries
(Alba Iulia, Bistrița,
Satu Mare and Zalău)

5.000+
accommodation places

3 canteens

Sport Halls

Swimming Pool

Library and Bookstore

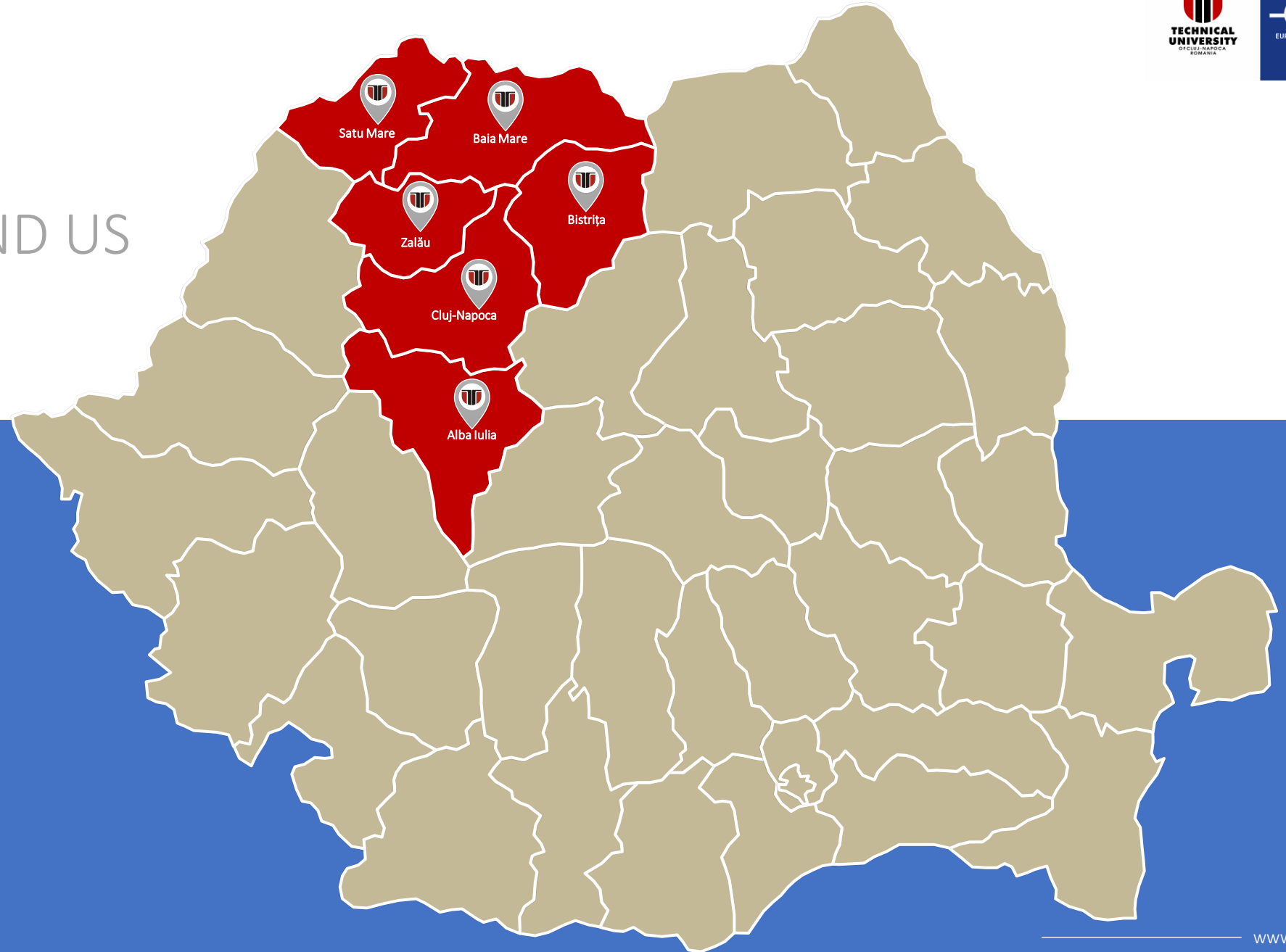
Publishing House

Printing House

66 000+ Alumni

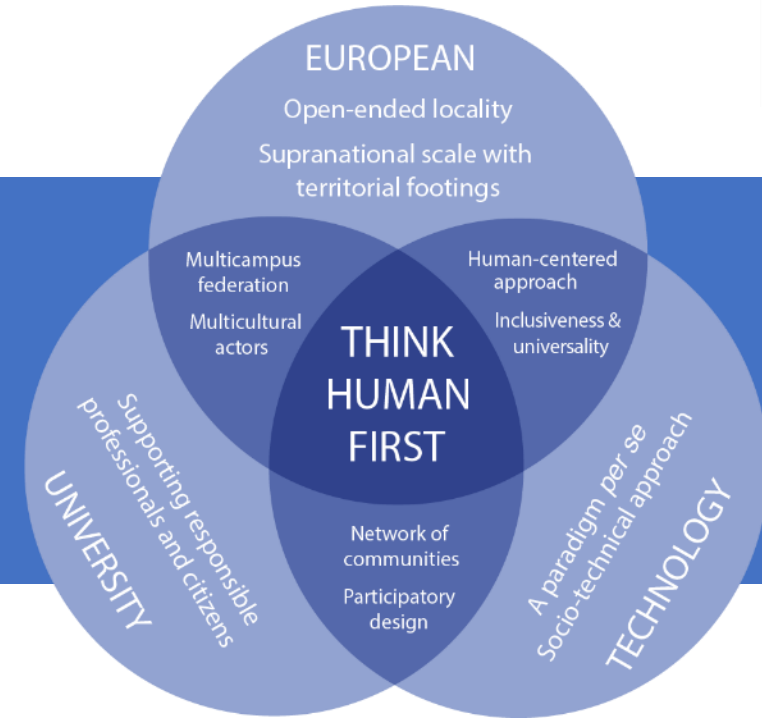


WHERE
CAN YOU FIND US

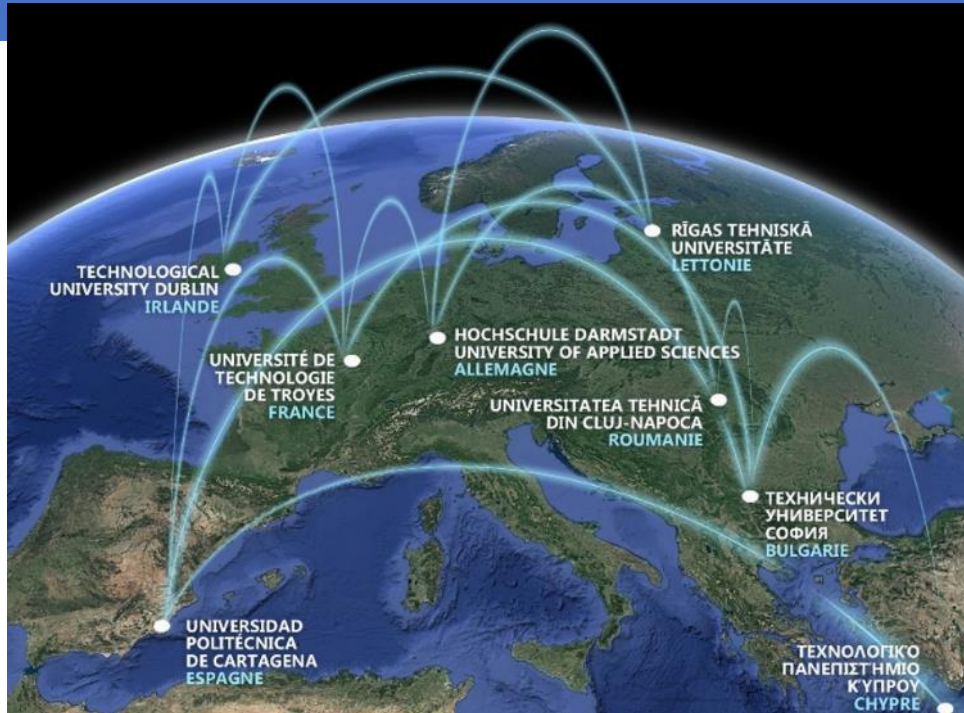




EUT+ CONSORTIUM



TECHNICAL UNIVERSITY OF CLUJ-NAPOCA | ROMANIA

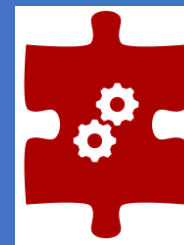




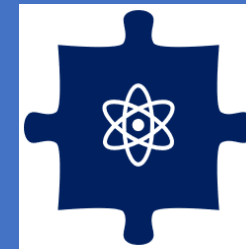
RESEARCH

IN TECHNICAL UNIVERSITY OF CLUJ-NAPOCA

- Research is conducted at department level, predominantly in 80+ accredited research structures.
- The research strategy aims at creating self-sustainable interdisciplinary and multidisciplinary structures capable of outstanding scientific achievements.
- Institutionally, the following multidisciplinary domains of research are supported.



ENGINEERING



MATHEMATICS AND SCIENCES



HUMANITIES AND ARTS



2021-2022

UNIVERSITY NUMBERS

STUDENTS	No.
B.Sc. (bachelor programme)	14,426
M.Sc. (master programme)	4,214
PhD	838
TOTAL	19,478

STAFF	No.
Academic & Research	968
Administrative	888
TOTAL	1,856





UNIVERSITY NUMBERS

GRADUATES
2021

FACULTY	Bachelor	Master	Total
Architecture	93		93
Civil Engineering	316	174	490
Building Services Engineering	113	38	151
Automation and Computer Sciences	640	253	893
Electronics, Telecommunications and Information Technology	363	119	482
Electrical Engineering	275	149	424
Industrial Engineering, Robotics and Production Management	496	268	764
Automotive, Mechatronics and Mechanical Engineering	289	140	429
Materials and Environmental Engineering	75	91	166
Sciences (BM)	266	192	458
Humanities (BM)	247	227	474
Engineering (BM)	168	133	301
TOTAL			5,032



BACHELOR PROGRAMS

OFFERED IN
ENGLISH | GERMAN

Applied Electronics B.Sc. | EN

Automation and Applied Informatics B.Sc. | EN

Civil, Industrial and Agricultural Buildings B.Sc. | EN

Computer Science B.Sc. | EN

Industrial Economic Engineering B.Sc. | EN

Manufacturing Engineering B.Sc. | DE

Manufacturing Engineering B.Sc. | EN

Robotics B.Sc. | EN

Telecommunications Technologies and Systems B.Sc. | EN



MASTER PROGRAMS

OFFERED IN
ENGLISH | GERMAN | FRENCH

FIGURES

29 DOMAINS

90 STUDY PROGRAMS IN ROMANIAN

5 STUDY PROGRAMS IN FOREIGN
LANGUAGES

- 3 in ENGLISH
- 1 in GERMAN
- 1 in FRENCH

Advanced Techniques in Automotive Engineering M.Sc. | EN

Image and Signal Processing M.Sc. | FR

Innovative Production Process and Technological Management M.Sc. | DE

Robotics M.Sc. | EN

Virtual Engineering for Competitive Manufacturing M.Sc. | EN

Building Services for regenerative cities M.Sc. | EN





Civil Engineering Faculty



FACULTY OF CIVIL ENGINEERING

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Buildings and Management
(25 academic staff)

Structures
(29 academic staff)

Structural Mechanics
(25 academic staff)

Railways, Roads and Bridges
(21 academic staff)

Land Measurements and
Cadastral
(14 academic staff)

DEPARTMENTS

15, C. Daicoviciu Street, 400027 Cluj-Napoca, Romania
Dean's office - Room 470 | Phone: +40 264 401249, Fax: +40 264 594 967
Secretary - Room 471 | Phone: +40 264 401 250





FACULTY OF CIVIL ENGINEERING

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B.Sc.

Civil Engineering

- Civil, Industrial and Agricultural Buildings - RO|EN
- Railways, Roads and Bridges
- Hydrotechnical Facilities and Buildings
- Urban Engineering and Regional Development

Engineering and Management

- Economical Engineering in Civil Engineering

Geodesic Engineering

- Land Measurements and Cadastre





FACULTY OF CIVIL ENGINEERING

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Civil Engineering and Building Services

M.Sc.

- Structural Engineering (double diploma with the University of Bologna)
- Transport Infrastructure Engineering
- Sustainable Concrete Constructions
- Geotechnics Engineering
- Green Buildings
- Advanced Design of Timber and Steel Structures (Baia Mare)

Engineering and Management

- Project Management and Real Estate Evaluation

PhD

- Civil Engineering






FACULTY OF
CIVIL ENGINEERING

**DEPARTMENT OF
CIVIL ENGINEERING AND MANAGEMENT**

Main Research Topics

Building Materials;
Thermal Performance and Acoustic Insulation of Buildings;
Enclosure Fire Dynamics;
Design of masonry, reinforced concrete and wood structures;
Structural and thermal rehabilitation of buildings;
Sustainable development of construction through efficient
management;
Building rehabilitation technologies.

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**DEPARTMENT OF
STRUCTURES**

Main Research Topics

Seismic protection and rehabilitation of earthquake damaged buildings;
Precast hybrid structural systems having self-centering capabilities;
Adaptation of the displacement-based analysis methods to single-story structures and risk
analysis of excessive displacements of single-story structures;
Deformation of reinforced and prestressed concrete floors - numerical and experimental tests;
Research on semi-rigid joints, cold formed steel structures and composite structures;
In situ and laboratory determination of soil properties;
Correlation of FE models with the site measured soil behavior;
Geo-energy structures behavior.



FACULTY OF

CIVIL ENGINEERING

DEPARTMENT OF **STRUCTURAL MECHANICS**

Main Research Topics

- Steel structures with semi-rigid connections;
- Nonlinear analysis of structures subjected to static and dynamic loading;
- Behavior of cable-membrane structures;
- Behavior of reticulated structural systems;
- Earthquake protection of buildings through seismic isolation and energy dissipation;
- Nonlinear analysis of reticulated structures using finite strain method;
- Computer programs for linear and nonlinear analysis of 3D structures;
- Advanced analysis of concrete slabs using finite element method;
- Ductility of punching shear zones in concrete slabs.



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DEPARTMENT OF **RAILWAYS, ROADS AND BRIDGES**

Main Research Topics

- Advanced materials for Transport infrastructures;
- Calculation and Design of rigid and flexible road systems;
- Environmental protection and sustainable development in transport activity;
- Urban mobility and accessibility;
- Advanced structures for bridges and artworks;
- Composite steel-concrete bridges, steel bridge, concrete bridge;
- High speed railway tracks;
- Tunnels and metro lines.



FACULTY OF
CIVIL ENGINEERING

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DEPARTMENT OF
LAND MEASUREMENT AND CADASTRE

Main Research Topics

Topographic measurements;

Cadastral documentation;

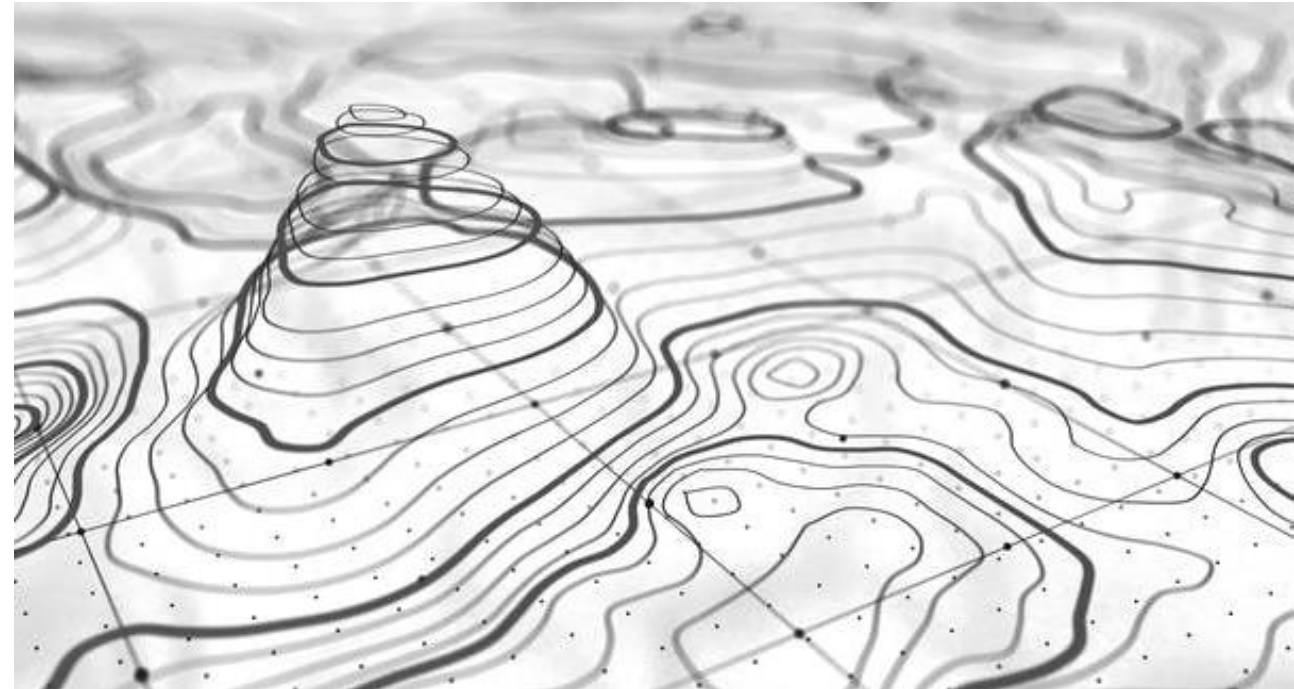
Construction layout;

GIS applications and mapping;

Photogrammetry, Remote Sensing and Geospatial engineering

Monitoring the behavior of land and buildings over time;

Evaluation of properties.





Master of Green Buildings

Master of Green Buildings

Main teaching areas:

- Green Buildings Design structural, hygrothermal, waterproof, acoustic,
- Sustainable construction materials and construction technologies
- Advanced building systems: HVAC, lighting, alternative sources
- Economic and environmental assessment of green buildings
- Energy management of green buildings
- The Entrepreneurship of Sustainable Development

Master of Green Buildings

Competences :

- Energy efficient and sustainable design and assessment of buildings (i.e. nZEB, passive house, PlusEB) and building systems
- Use of advanced computer techniques in the field of energy efficient and sustainable design
- Application of energy efficient constructive solutions and technologies in constructions
- Investment assessment for energy efficient and sustainable buildings (i.e. LCC, LCA)



WP2

CASE STUDY

**BIM models of a building structure
and a road section carrying out a life
cycle sustainability assessment
(LCSA) of different materials and
waste materials from building and
demolition processes**

TUCN TEAM

Assistan Professor Dorin Beu
Lecturer Mihai Senila
Lecturer Mojolic Cristian
Lecturer Maria Pop
Phd Student Andreea Onea

Student Simon Blanka
Student Madalina Dinis
Student Antal Botond
Student Kovrig Peter



BIM

Its Important to know

> *BIM is not a technology. It is a process.*



> *BIM applies to all aspects.*



Design



Estimating



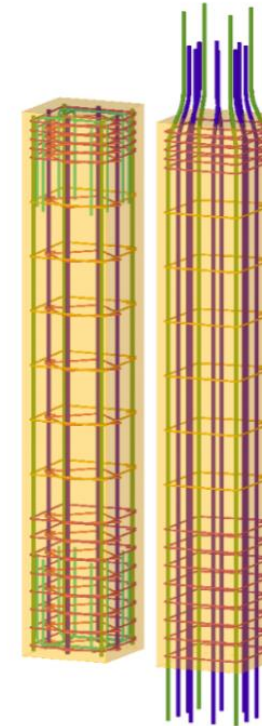
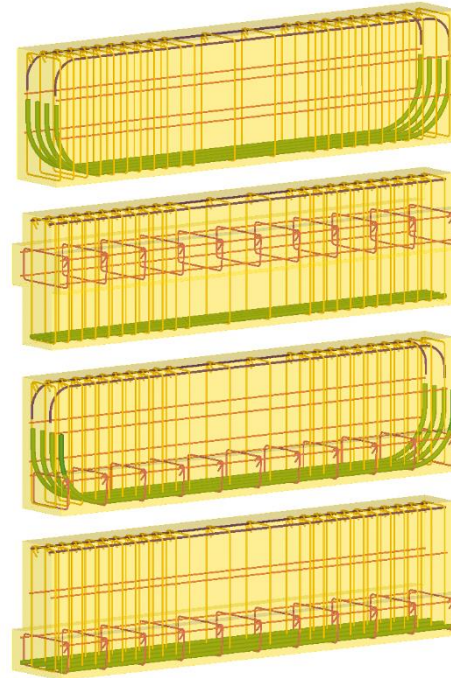
Supply Chain



Facilities Management

TEKLA STRUCTURES

BIM



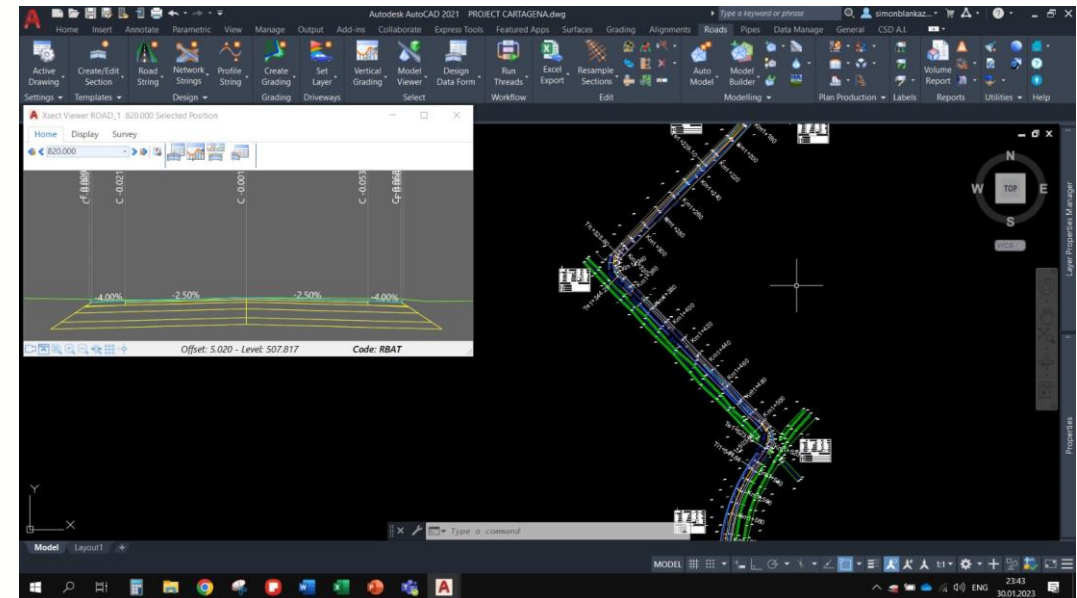
BIM

ROAD GENERAL DESIGN



**ADVANCED ROAD DESIGN
pentru AutoCAD**

Australian Design Company
ARD Unic Distribuitor

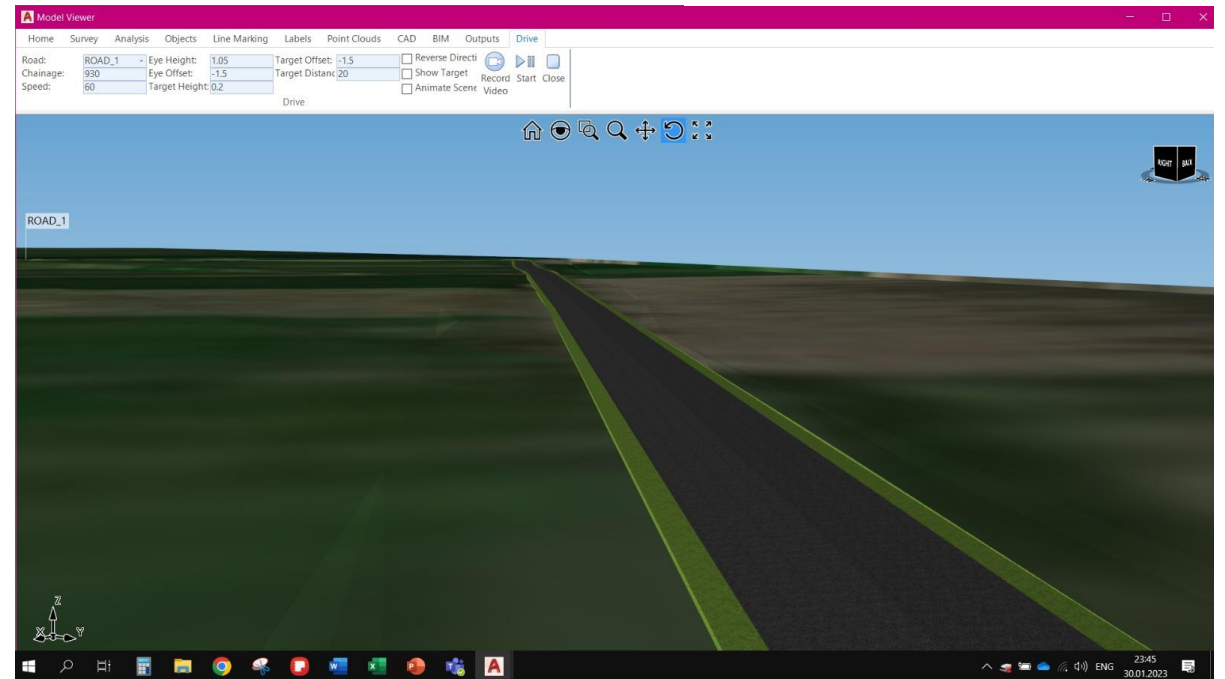
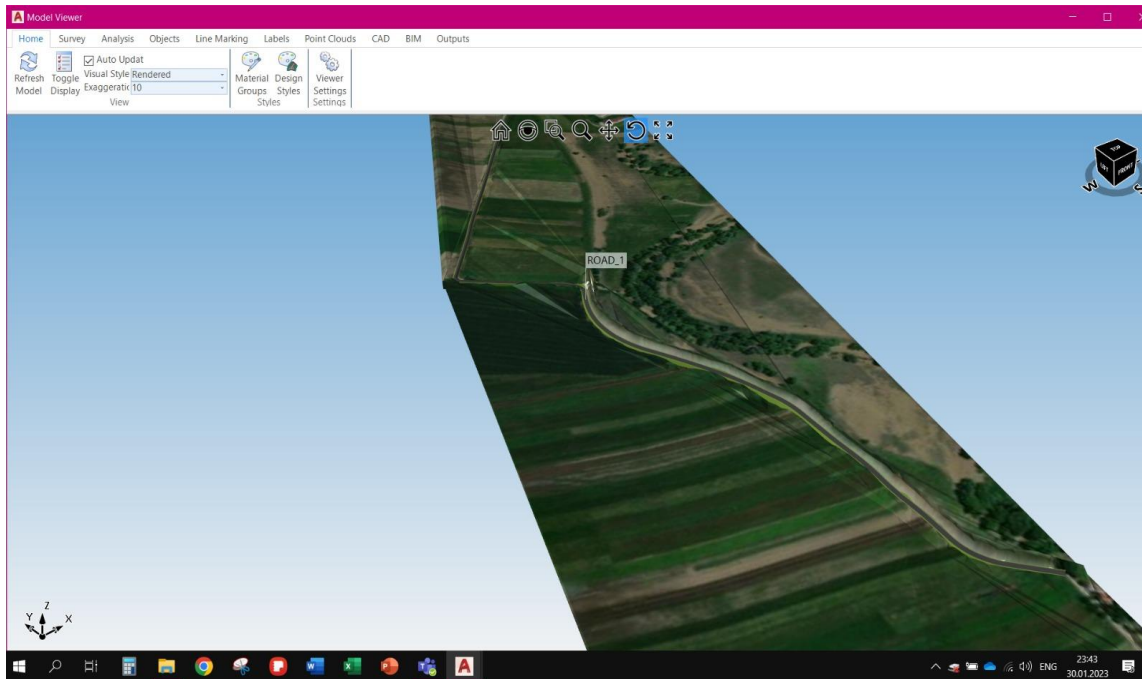


BIM



**ADVANCED ROAD DESIGN
pentru AutoCAD**

Australian Design Company
ARD Unic Distribuitor



LCA



Easy to use tools for construction sustainability metrics and impact reduction



LIFE CYCLE ASSESSMENT



LIFE CYCLE COSTING



EMBODIED CARBON REDUCTION



EARLY DESIGN OPTIMIZATION



CIRCULARITY ASSESSMENT



EPDs GENERATION



THANK YOU



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