Energy Usage and Green Public Transportation in Future Smart Cities: An Innovate Teaching Program for Students, Stakeholders and Entrepreneus
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Project Brief

Energy Usage and Green Public Transportation in Future Smart Cities: An Innovative Teaching Program for Students, Stakeholders and Entrepreneurs

Green public transportation is a multidisciplinary subject which focuses on designing the unimodal or intermodal public transportation system in the cities, energy usage in these systems, information systems to gather information related to possible passengers.
Green public transportation is a common subject for all countries and this will be the most interested technological area not only for developed countries but also developing countries. All cities will transform their traditional transportation systems to cutting-edge high technology transportation systems.

One-week teaching program made up of 7 teaching modules will be developed within the scope of the project in order to train students and create entrepreneurs who will develop innovative solutions for the cities of the future, and increase the awareness of institutions and organizations in this field.
The scope of the project is to develop a one-week teaching program which is made up of seven teaching modules and one supporting module to teach the future green public transportation systems in the future smart cities, as listed below (seven teaching modules):

- Smart mobility and other "smart" parts assuring green future
- Energy Related Smart Grids
- Green Vehicles and Green Public Transportation Network Design
- Intermodal Green Public Transport Planning
- Information Systems and Technologies for Green Public transportation
- Economics of Green Public Transportation Systems
- Entrepreneurship Opportunities Considering Smart City Public Transportation,

Project Partners

TED University

TED University (TEDU) was established in 2009 by Turkish Education Association (TED) – an NGO found in 1928 to help educating students with limited financial means. Priding itself as a liberal arts University, TEDU aims to raise creative, critical and self-confident students. Emphasizing Sustainable Development Goals in its vision, TEDU has become a full member of Euclid Network, Global Impact Investing Network and UN-SDSN.

TEDU encourages its academic staff to develop problem driven research agenda as well as pure academic research. Being one of the very few liberal arts universities in Turkey, TEDU also desires to create a collaborative, skill and competency based, problem driven learning environment and encourages its students to be active citizens having their voice in city life, derive innovative solutions for social problems. University has research and project portfolio in urban design and history, social segregation and mobility, special needs education including the gifted, innovation and use of technology in education, project management, social entrepreneurship and sustainability, psychology research, immigration, gender, employment, machine learning, data science, high performance computing, artificial intelligence and robotics.

TED University is responsible to develop Module 1, Module 4; Module 7 and Module 8. Module 4 includes Review of the Current Network, Focusing on Future Transportation Network, and Comparison of Current and Future Networks. Module 7 includes Review of the Current Situation, Economics of Green Public Transportation, and Financing Green Transportation Projects. Module 8 includes introduction to intellectual property rights, patent search, development idea and preparation project proposal, development business plan and financial opportunities for green entrepreneurship. The project team consists of Assistant Professor Zafer Yilmaz, Associate Professor Ibrahim Unalmis, Research and Teaching Assistant Oyku Yucel, and Gizem Celik from Department of Business Administration, Assistant Professor Sibel Akin from Department of Elementary Education-Primary Education, Assistant Professor Pelin Irgin from Department of English Language Education, and Seda Damla Yücel from Directorate of Technology, Innovation and Research.

Middle East Technical University (METU)

Middle East Technical University (METU), founded in 1956, is an international research university, which seeks excellence in serving the country, region, and the world. This well-deserved reputation is partly a reflection of its leading position in terms of international scientific publications and share of research funds from national scientific research funding agencies, primarily The Scientific and Technological Research Council of Turkey (TÜBİTAK), among the most prominent universities of Turkey.

METU – as an international research-intensive university – is among the leading universities in Turkey in terms of depth and breadth of international research projects and the number of funds generated from research activities. METU has approximately 400 R&D projects nationally funded by TÜBİTAK and various ministries and 60 R&D projects internationally sponsored, mainly by the EU Research and Innovation Framework Programmes. This record of accomplishment translates into METU bringing in about 9% of the FP-sourced research funds acquired by Turkey until now. Last but not least, it is important to the point that the language of education in METU is English. Moreover, METU strategically values the prevention of inbreeding by prioritizing the employment of researchers who have had international experience at doctoral and/or post-doctoral level(s). Thus, a significant portion of METU's faculty is constituted of incoming researchers from Europe and/or Third countries (mostly the US).

Middle East Technical University (METU) and TEDU are responsible for developing Module 1, which aims to develop an innovative curriculum for the program and suggest innovative teaching and evaluating methodologies for all modules in the project. This supporting module, called "Innovative Curriculum Development for Smart City Public Transportation," is led by Dr. Sibel Akin from TEDU and Dr. Yesim Capa Aydın from METU (both education experts). They are also responsible for supervising the suitability of the prepared intellectual output content for education.

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University of Ljubljana (UL)

University of Ljubljana with its rich tradition was founded in 1919. It has approximately 38,000 undergraduate and postgraduate students and employs approximately 6,000 higher education teachers, researchers, assistants and administrative staff in 23 Faculties, 3 Arts Academies and 3 Associated Members (National University Library, UL Central Technical Library, UL Innovation Development Institute).

Univerza v Ljubljani

UL ranks among the top 3% of universities in the world. UL is the oldest and largest higher education and scientific research institution in Slovenia. Ljubljana's wide thematic spread and steady level of excellence is documented by the fact, that it is present in 32 Subject in the Shanghai ranking, showing particular strengths in Mathematics, Sciences and Engineering subjects, in Business Administration and Economics as well as in Agricultural and Food Sciences. UL is the co-founder of the Slovenian Innovation Hub, which operates as a facilitator and promoter of development and research teams in the academic and business sphere and the Institute for Research and Innovation. UL is also a member of numerous international networks like EUA, EUTOPIA, The Guild, CELSA, UNICA, Utrecht Network and a member of LERU-CE7 initiative. From 2008, UL is committed to respect the principles of the European Charter for Researchers and the Code of Conduct for Recruitment of Researchers and since 2013 by developing the UL Strategy of Researchers' Career Development UL is the holder of the EC award 'HR Excellence in Research'.

University of Ljubljana is responsible to develop two modules: Module 2 and Module 3. Module 2 includes review of the current city transportation, focusing on smart city transportation, focusing on "smart" trends and related issues, comparison of current and smart city transportation systems. Module 3 includes future-smart infrastructure fusion of data, energy, and mobility, energy usage in current transportation, using green energy in transportation, and comparison of two systems. The project team consists of Professor Anton Manfreda, Professor Aleš Groznik, Bor Krizmanič, Luka Tomat, and Kristina Nagode from University of Ljubljana, School of Economics and Business.

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University of Split

UNIST (established in 1974) is a comprehensive scientific and teaching institution, consisting of 11 Faculties, 1 Academy of Arts and 4 Departments. There are around 20,000 students enrolled in its undergraduate, graduate and post-graduate programmes. The focus of the research work carried out is on disciplines characterized by natural, cultural, historical, social, economic and other features of the region as a part of the Croatian Adriatic and the Mediterranean region as a whole. UNIST employs approximately 1750 persons, including academic and administrative staff.

International networks (EUA, Tethys, UNIADRION, EAIE…) that promote internationalisation of HE and exchange of good practices in different disciplines. There are over 550 Erasmus+ cooperation agreements and 80 bilateral agreements with universities worldwide. UNIST is participating in European projects management and implementation since FP6 and is currently engaged in the following programmes: H2020, Interreg, Erasmus+, COSME, EuropeAid and FP7. There are also several ongoing projects funded by ESI funds: ESF and ERDF.

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Atomic Intelligence

Atomic Intelligence is a data company. It develops data driven products and advanced business solutions based on data science methods and we see the future as predominantly working with data and reacting based on data. It is a company that, thanks to the extensive and long experience of its employees, combines traditional (DWH, BI) and modern solutions in the data world (Big Data, Data Lake, AI). The focus of their work is helping their clients to monetize, or better use (their own) data to make better business decisions.

University of Split and Atomic Intelligence are responsible to develop Module 6 which includes review of the current network, focusing on future information systems, and comparison of current and future information systems. The project team consists of Associate Professor Maja Cukusic, Associate Professor Silvia Golem and Ivana Ninčević Pašalić from University of Split and Tomislav Križan from Atomic Intelligence.

Polytechnic University of Bucharest

Polytechnic University of Bucharest (UPB) stands for an integrated part of the international academic community, being member of over 20 organizations, such as EUA, EUA-CDE, CAESAR. UPB provides through its 15 faculties: (I) bachelor's degree studies – organized in 88 study programmes in 17 scientific fields; (II) master's degree studies – organized in 190 study programmes in 19 scientific fields; (III) doctoral studies – organized in 14 doctoral schools. Teaching language is Romanian, but there are study programmes in English, French and German, mainly in the Faculty of Engineering in Foreign Languages.

Polytechnic University of Bucharest is responsible to develop Module 5 which includes configurations of intermodal public transport network, modelling intermodal public transport networks, planning intermodal public transport. The project team consists of Associate Professor Dorinela Costescu and Assistant, Ph.D Sergiu OLTEANU from Transport, Traffic and Logistics Department of Transport Faculty.

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Project Modules

Module-1

"Innovative Curriculum Development for Smart City Public Transportation"

Module 1 will be the supporting module as "Innovative Curriculum Development for Smart City Public Transportation" which includes "Designing Instructional Process and Assessment and Evaluation". This module will create opportunity for project partners to have knowledge about innovative curriculum structures, innovative teaching and evaluating methodologies to exploit while preparing their own modules. TED University is responsible for curriculum design and innovative teaching methodologies and Middle East Technical University (METU) is responsible for innovative assessment and evaluation techniques.

Module-2

"Smart mobility and other smart parts assuring green future"

Digital transformation is presenting a challenge for organizations, but it also impacts on individuals and society. Cities and living in cities is not an exception and several smart city-related initiatives are emerging by addressing the key issues of modern life including transport, energy, environment, public administration and citizen involvement. The fusion of technology and mobility lies at the heart of smart cities with the purpose to ease the way of living and enabling a better environment. Properly managing these smart initiatives and implementing new business models is crucial and increasingly demanding. Several important issues and challenges will be addressed by this course.

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Module-3

"Energy Related Smart Grids"

The course will provide learners with the knowledge to identify the role of smart grids and energy in smart cities and their relationship with mobility. Learners will gain an understanding of traditional and smart grid concepts. The course will also address the transition to several renewable energy sources and their inclusion in the energy system.

Module-4

"Green Vehicles and Green Public Transportation Network Design"

The aim of the module is to evaluate current public transportation technologies and introduce alternative future green transportation technologies in smart cities. It will help to increase the learners' sensitivity about the energy usage and air polluting problems caused by current public transportation technologies. The module focuses on analysing alternative green transportation technologies in future smart cities, discussing information systems, efficient tools in green public transportation network planning of future smart cities and comparing current and future public transportation technologies by the end of the course.

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Module-5

"Intermodal Green Public Transport Planning"

Mobility brings many benefits for its users, but with costs for our society. These include greenhouse gas emissions, air, noise, and water pollution, but also accidents and road crashes, congestion, and biodiversity loss. Sustainable mobility solutions should seek to stimulate the balanced development of the transport modes while encouraging a shift towards more sustainable modes. Therefore, the strengths and weaknesses of the different modes of transport must be evaluated, and solutions for intermodal mobility services must be identified to increase the attractiveness of the public transport and non-motorized travel modes. The module aims to introduce core concepts of intermodal public transport and different intermodal services as a sustainable mobility solution. The course will introduce the main characteristics of different transport modes and will provide participants the opportunity to identify measures to increase the attractiveness of intermodal public transport.

Module-6

"Information Systems and Technologies for Green Public Transportation"

The course will provide participants with the overview of technologies and information systems across various green public transportation modes, whether these are used by pedestrians or integrated in bicycles, buses, and rails. Learners will be introduced to innovative and underlying concepts and technologies, in particular - cloud computing, big data, Internet of Things (IoT), and artificial intelligence, that enable public sector organisations to adapt to climate challenges and that lead to changes in organisational processes, operating models, and ways of providing services (Mobility as a Service, MaaS) to the general public. They will be given an opportunity to discuss the collection, sharing, integration and control of data derived from related information systems, as well as the potential for data analytics processes, development of prediction models, and tools for visual analytics. Upon reviewing real-life case studies provided by the industrial partner, learners will be supported in developing their decision support models that could ensure a better quality of service delivery and increase efficiency and effectiveness of green public transport.

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Module-7

"Economics of Green Public Transportation Systems"

Increasing use of green public transportation systems has economic outcomes for all countries. Our module focuses on various factors influencing green public transportation demand and supply, pricing strategies, use of different fiscal policies and key points in financing green transportation projects to help our stakeholders encourage growth of smart sustainable cities.

Module-8

"Entrepreneurship Opportunities Considering Smart City Public Transportation"

When economic developments and new structures in economy are considered, it cannot be ignored that entrepreneurship plays an important role in global economic development. The existence of a strong intellectual property (IP) policy plays a major role in promoting entrepreneurship, which has a significant impact on ensuring a strong and sustainable economic growth. With the emergence of new technologies developed by entrepreneurs, SMEs, universities etc., many cities have started to take important steps towards establishing smart cities to provide new urban services by increasing the quality of life and standards of citizens.

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