



Research Strategic Plan

Energy Engineering Faculty

2024-2029



1. Introduction

The program seeks international cooperation in research through the following means:

- Participation in contractual regional and international research projects as a leading implementation partner and as a full or guest implementing member;
- Participation in energy engineering projects leading to the creation of original datasets or in refining and modernizing data for the purposes of research in Energy Engineering;
- Supporting non-contractual mobility through conferences, symposiums, roundtables, lectures, publication events;
- Supporting and promoting co-authorship and co-presentation of publications and research reports with colleagues from international universities;
- Supporting in-coming mobility of the most established researchers in the various fields of Energy Engineering;
- Sponsoring open-access publications where necessary;
- Supporting peer-reviewing engagements of academic staff in the international scene;
- Supporting major book projects through friendly adjustment of teaching and administrative engagement expectations for lecturers, and even sabbatical leaves in foreign universities where cooperation takes place.

List of international cooperation in research and teaching:

- International cooperation with more than 300 Institutions worldwide (EU, UK, USA, Asia, SEEC)
- Double Degrees, Joint degree and Certifications
- Study visits of students, Staff, Businesses and Government's people.
- EU Higher Education Projects and CEEPUS:
- 6 Tempus Projects, since 2004
- 5 Erasmus Mundus Projects incl. SIGMA
- Erasmus +, KA1 Mobility Grants, Capacity Building – EURPS
- Capacity Building Support for successfully application and Networking in FP7 / National Contact Point for Horizon 2020 for ICT and FET
- Different Projects with International and National Organizations and Donors: European Commission, World Bank, EBRD, UNHABITAT, UNICEF, USAID, GIZ, ADA, Czech Republic, Switzerland, Norway, Sweden, etc.

International Recognitions

- Professional and Scientific Membership of UBT on Education, Science and Technology International Communities:
IFAC, IEEE, IPMA, EOQ, EUROSIM, FIRA EU Chapter, AESOP, PLAN, EFQM, QA, IASP, EURAM, SAP University Charter, BUA.

Below are samples of selected projects UBT implemented and partnership agreements that UBT signed with international partners

TEMPUS Program 1 & 2 – Curriculum Development Bachelor and Master Study Mechatronics Management in Kosovo (ULMK) & (MSMMK) – The program provides a well-structured education in principles of mechanical, electrical and computer engineering and management. Different modules are structured in order to equip the student with the theoretical and practical aspects of the subject. The mechatronics engineering program at UBT is the only one of its kind in the country and the region. The need for a study program that combines aspects of mechanical engineering, electronics engineering, control systems and computer systems was seen as extremely important for the country and the region. Moreover training the future generations of engineers and giving them a comprehensive set of skills is extremely important for engineering industry and for society.

TEMPUS Program 3 – “Supporting and Developing the Structures for the Q&A at the Private Higher Education Institutions in Kosova”- The TEMPUS project focused was definition quality assurance that can be understood as all actions taken to ensure that standards and procedures are adhered to and that delivered products or services meet performance requirements. In particular for higher education institutions this definition implies, that quality assurance is a continuous process of improvement accompanying the development of knowledge and experience in a given discipline, the requirements of the market and the stakeholders and the national and international legislative demands.

TEMPUS Programme4 – “Encouraging the process of curriculum development based on learning outcomes in the private higher education institution of Kosova “- The Project is designed to provide support the HEI of Kosovo for Curriculum design based on learning outcomes, involvement of stakeholders, and sharing the experience regarding curriculum design from the different EU universities. UBT is very much dedicated to the project and always contribute with its experience in order it increase the benefit as it is aim of the project.

TEMPUS Programme 5 – UBT is also part of the Tempus 5 program on higher education.

ERASMUS MUNDUS Program –EM2STEM (2010-2014)- The first tangible outcome of this new partnership has been the formation of a consortium of 18 universities (led by City University), to bid for Erasmus Mundus EM2-STEM (Western Balkans) funding for 264 staff and student motilities at Bachelor, Masters and PhD levels. The bid designated UBT as coordinator for the eight universities from the Western Balkans. The bid was successful, with Euro 3.9 million awarded over three years; a total of 37 mobility places allocated to Kosovo (second highest allocation); the kick-off meeting was held in Berlin in January 2011.

ERASMUS MUNDUS Program –EM2STEM (2010-2014)- The first tangible outcome of this new partnership has been the formation of a consortium of 18 universities (led by City University), to bid for Erasmus Mundus EM2-STEM (Western Balkans) funding for 264 staff and student motilities at Bachelor, Masters and PhD levels. The bid designated UBT as coordinator for the eight universities from the Western Balkans. The bid was successful, with Euro 3.9 million awarded over three years; a total of 37 mobility places allocated to Kosovo (second highest allocation); the kick-off meeting was held in Berlin in January 2011.

ERASMUS MUNDUS Program –SIGMA (2012-2016) – Based on evaluation and results of the UBT students during the mobility at Erasmus Mundus Program EM2STEM, UBT is again part of

the consortium for a new Erasmus Mundus Program called SIGMA. Through this program UBT will make possible the mobility of about 20 students to the EU partner Universities and welcomes all interested students to be part of the UBT study programs. Through the program UBT, and its students, are doing promotion of the Kosovo's young generation oriented to the global education.

AEP Academic Exchange Program – UBT and Jovik University Norway have reached an agreement of cooperation in staff development, teaching and research.

UBT- City University Joint-Research – UBT and City University London have signed a cooperation agreement for joint research.

SEECEL- The South East European Centre for Entrepreneurial Learning – UBT has been part of the SEECEL The South East European Centre for Entrepreneurial Learning (SEECEL) that is a regional institution with a mission to promote inclusion of entrepreneurial learning and entrepreneurial literacy in eight pre accession countries of South East Europe (SEE). SEECEL is financed by the European Union (EU). There is widespread recognition that entrepreneurship is the driving force behind national economies and societies. Entrepreneurship brings benefits both at the society level and at the individual level through personal satisfaction and achievement, while also promoting sustainable and smart growth and development. Parallel to the evolution of the field of entrepreneurship, there is increasing interest in the development of educational programs to encourage and foster individual entrepreneurial competences.

Improvement of investment and entrepreneurial climate in Kosovo- Kosova /EU-Czech Republic/SOROS – The project expects to impact on Kosovo regions abilities to create favorable conditions for attracting FDI and accelerating economic transformation. As the Kosovo regional development players often lack examples and best practice on how to actively promote FDI and attract foreign investors, the project's anticipated impact should result in strengthened capacities of regional development agencies and their nongovernmental counterparts. This, in turn, should lead to increase of number of FDI projects located in Kosovo regions; and, ultimately, to accelerated social and economic transformation of Kosovo regions with all associated positive effects. International impact expected from the outcomes and results of the activities of this initiative. On the international level the project hopes to lead to improved international competitiveness of Kosovo since FDI projects located in a host economy directly impact on country's business sophistication, infrastructure development, market efficiency and capacity for innovation – all of which are included in global competitiveness measures (e.g. Global Competitiveness Index). Workshop for all institution involved in the attracting the Foreign Direct Investment. Study visit for 12 stakeholders involved in strategy created for FDI.

Investment Friendly Municipality-Kosova /EU-Czech Republic/Local Government – Provision of highly practical advice, expertise and know-how in FDI promotion to municipalities of a selected Kosovo region. Sharing of an internationally recognized accreditation methodology developed in the Czech Republic with Kosovo partners. Accreditation of up to 15 municipalities from a selected Kosovo region in FDI promotion and further. Increased awareness about the role of FDI in economic development in Kosovo.

Feasibility Study for Economic Zone of Gjilan and Novoberde Municipality- Kosova/EU-Czech Republic/Local Government – This study was commissioned by Kosovo municipalities of Gjilan and Novobërdë to determine the market demand and financial viability of establishing an economic zone in Llabjan. The study was prepared under a Czech development cooperation program Aid for Trade 2013 by a Czech contractor CzechINVENT Technology Agency and Quality Kosova Institution of UBT.

2. UBT Research Report

UBT strongly encourages staff members to publish and according to their contracts they should have at least two publications per year. In the UBT, 100% of lecturers are either research active, or engaged in self-tasked research, while many of them are active researchers at an international level. According to the contract that UBT staff has they should have at least two publications per year. As a matter of fact, this is not the case that every single academic staff makes two publications per year. UBT has been working on increasing the number and quality of the academic outputs of its both academic and research staff.

UBT assigned research coordinators at the departmental level who are generally vice deans. In some departments the research activities are monitored by the deans. Names of the responsible staff members and their department are provided below:

Name	Department
Bertan Karahoda	Mechatronics
Dardan.Dreshaj	Medicine- Nursing
Artan Mustafa	Political Science
Gjylje Rexha	Media and Communication
Alisa Sadiku	Education
Visar Krelani	Civil Engineering
Shpend Dragusha	Pharmacy
Valon Durguti	Food Science
Visar Bunjaku	Dentistry
Behar Selimi	Law
Blerton Abazi	Information Systems
Muhamet Gervalla	MBE
Besnik Qehaja	Computer Science
Artrit Bytyci	Design
Gazmend Ejup	Art
Mimoza Sylejmani	Architecture
Armend Ymeri	Energy Engineering
Deniz Celcima	Psychology

The responsibilities of the research coordinators are as follows:

- Tracking the Research output of the Academic staff
- Research Strategy Formulation
- Determination of Code of Ethics in the Departmental Level
- Creation of Research Clusters in departmental level
- Determination of Research Platforms in the ins and departmental level
- Determination of Research Priorities of Staff
- Preparation of Research Reports twice a year

Moreover UBT assigns coordinators at the department level that are responsible for the organization of the annual UBT conferences. Their names are provided below:

Name	Department
Xhemajl Mehmeti	Mechatronics
Dardan Dreshaj	Medicine- Nursing
Artan Mustafa	Political Science
Safet Zejnullahu	Media and Communication
Arberesha Kastrati	Civil Engineering
Eda Mehmeti	Pharmacy
Violeta Lajqi-Makolli	Food Science
Visar Bunjaku	Dentistry
Albulena Ukimeraj	Law
Bejtush Ademi	Information Systems
Sema Kazazi	MBE
Besnik Qehaja	Computer Science
Sebil Spat	Design
Aferdita Statovci	Art
Mimoza Sylejmani	Architecture
Armend Ymeri	Energy Engineering
Vjolca Shahini	Psychology

The responsibilities of the conference coordinators are as follows:

- Delivering the 1.st Call for papers
- Delivering the 2. nd Call for Papers
- Acceptance of Abstracts
- Notification of Authors about the Abstracts
- Acceptance of Full papers
- Notification of Authors about the Full papers
- Regular meetings once in every two weeks

UBT organizes one of the biggest conferences of the region. UBT staff members are strongly encouraged to make presentations and publish in the conference proceedings. Below is the summary of the latest UBT conference:

The 12th UBT International Conference took place in Prishtina, the capital city of Kosovo on October 28 - 29, 2023. The main perspective of the conference was to connect the scientists and practitioners from different disciplines in the same place and make them be aware of the recent advancements in different research fields, provide them with a unique forum to share their experiences, support the new academic staff for doing research and publish their work in international standard level.

Under the umbrella of this international conference is also Conference on Energy Efficiency Engineering (IC-EEE), which is organized for every consecutive year in the same period of the year. In October 28-29 of 2023, in UBT Science and Innovation Park, was organized International Conference on Energy Efficiency Engineering IC - EEE 2023.

The scope of the conference covers areas, such as:

- Power Systems
- Renewable Energy Sources
- Solar Systems
- Wind Power Systems
- Hydro Energy
- Energy Storage Technologies
- Geothermal Energy
- Fuel Cells
- Electrical cars
- Sustainable Systems
- Smart Grids
- Micro grids
- Energy Economy
- Energy Regulation and policies
- Energy Market
- Energy Efficiency
- Efficient Heating & Cooling Technologies
- Advancements in Thermal Insulation
- Co-generation
- Industrial Energy Efficiency
- Environmental impact of Energy Efficiency
- Energy Conservation
- Energy Efficient Buildings
- Agricultural Energy Efficiency
- Building Envelopes & Building Climatology

UBT is a co-founder and member of the CIGRE National Committee - Kosovo.

CIGRE (Conseil International des Grands Réseaux Électriques) – The International Council for Large Electric Grids is one of the main international organizations dealing with technical, economic, organizational and regulatory aspects of Electric Power Systems. It is a non-governmental and non-profit organization with headquarters in Paris, formed in 1921 with the aim of strengthening and developing the exchange of experiences and information between experts in the electrical field of all countries on the issue of energy production, transmission and distribution. CIGRE develops activities related to Conferences and Meetings, where scientific projects and works are presented and discussed, as well as through Study Committees that deal with problems of a technical and scenic nature.

Issues related to the planning and operation of electric power systems, the construction and maintenance of high voltage equipment as well as the production capacities of electricity are the core of CIGRE's interest. In addition, CIGRE also deals with the problems of protection of electrical power systems, telecommunication equipment and information systems.

Currently, 16 Study Committees are active, where each of them deals with a specific field of electrical engineering and where their work is carried out through the work of Working Groups, which include over 3500 experts in this field.

List of Study Committees:

KS A1 Electrical Machines

KS A2 Transformers

KS A3 High Voltage Equipment

KS B1 Cable Lines

KS B2 Overhead Lines

KS B3 Substations

KS B4 Single Phase System of HV (HVDC) and Power Electronics

KS B5 Protection and Automation

KS C1 System Development and Economics

KS C2 System Operation and Command

KS C3 System Performance in Environmental Protection

KS C4 Technical Performance of the System

KS C5 Energy Market and Rules

KS C6 Distribution Systems and Distributed Generation

KS D1 Materials and Emergency Testing Techniques

KS D2 Telecommunication and Information Systems

Conference on Technology, Culture and International Stability – 21 TECIS 2022, organized by UBT College of Business and Technology, Pristina and Vienna University of Technology, IHRT. The TECIS 2022 conference aimed to bring together researchers and practitioners from industry and academia to provide an overview of the state of the art, present new research results and share ideas and experiences in the field of international stability. The development of technology leads to dramatic changes in international stability. It has never been so important to examine system

stability. Currently and over the last few years, international and national social control systems have been shown to be inadequate and prone to being fundamentally and more fundamentally unsustainable. Many basic assumptions are no longer certain and are eventually questioned. This event has systematically reviewed these topics. Another goal of the TECIS conference was to propose new approaches in dealing with the effects of globalization, such as the study of complexity and knowledge management.

- The topics of this Conference was:
- Artificial Intelligence and Applications
- Biomedical Systems
- Control & Political Stability
- Control and Automation to Improve Stability
- Cost Oriented Automation (COA)
- Cross-cultural Aspects of Engineering
- Decision Support Systems for SME's
- Education for TECIS
- Engineering Ethics
- Enterprise Integration and Networking, Software
- Equality, Diversity and Inclusion
- Globalization in the age of AI
- Human Aspects of Safety and Risk Engineering
- Innovation Management
- Intelligent Systems and Applications
- Managing the Introduction of Technological Change to Improve Stability
- Mechatronic Systems
- Models & Simulation for TECIS relevant applications
- New Technologies for the environment
- Open Innovation and Applications
- Robotics and Handling Devices
- Semi-Automated Assembly and Disassembly (EoL)
- Social Networks
- Sustainable Design and Control
- Technology in Post-conflict Regions
- Tele-medical Systems
- Young Engineers in Control

UBT being the main organizer of this conference and aiming to implement an integrated strategy to establish itself as an internationally competitive, research-intensive institution, committed to the transfer of knowledge and the provision of a world-class education to the most talented students from all backgrounds partnered with the following institutions:

- University of Tirana – Faculty of Economics,

- University of Korca,
- Kosova Association for Control,
- Automation and Systems Engineering (KA – CASE),
- Kosova Association for Modeling and Simulation (KA – SIM),
- Quality Kosova,
- Kosova Association for Management.

The conference was sponsored by EUROSIM - The European Association of Simulation. The conference provided a forum for NGOs, academics, researchers, experts and practitioners active in education, research and development to present new research results, and share their ideas and experiences. This event offered scientists from 24 different countries and 4 different continents the opportunity to present their research results. The sessions were all held on October 29 - 30, 2021 at the UBT Innovation Campus Lipjan.

The conference consisted of sub conferences in 15 different fields being :

- Management, Business and Economics
- Law
- Political Science and International Relationship
- Media and Communication
- Computer Science,
- Information Systems
- Mechatronics and Robotics
- Energy and Systems Engineering
- Architecture and Spatial Planning
- Integrated Design
- Civil Engineering and Infrastructure
- Food Science
- Psychology
- Medicine,
- Pharmacy
- Dentistry
- Education and Development.

In total 51 sessions were held with a participation of 606 researchers and 285 presentations were made. The number of abstracts received was 422 and the number of international participants involved in the conference was 317.

Each sub-conference had its own agenda, keynote speakers, organization committee and international scientific committee. Below are the keynote speakers as per related sub-conferences:

1. Energy Efficiency and Engineering - Dr. Peter Groumpos, Ferdiana Hoti
2. Mechatronics System Engineering and Robotics- Dr. Peter Kopacek
3. Political Science and International Relationship- Dr. Olli E. Kangas-Dr. Velizar Shalamanov
4. Media and Communication- Adelheid Feilcke and Dr. Ferid Selimi

5. Computer Science - Dr. Felix Breitenecker, Dr. Niki Popper
 - a. Information Systems- Dr. Felix Breitenecker and Dr. Anita Mirjamdotter
6. Management Business and Economics- Dr. Edmond Hajrizi, Dr. Peter Groumpos
7. Law- Joana Qeleshi
8. Architecture and Spatial Planning- Dr. Csaba Patkos
9. Integrated Design- Aferdita Statovci and Dr. Miran Mohar
10. Civil Engineering and Infrastructure - Dr. Bruno Dal Lago, Dr. Francesco Foti
11. Food Science - Dr. Renata Kongolli and Fisnik Laha
12. Psychology- Moshe Landsman and Dr. Dashamir Berxulli
13. Medicine, Pharmacy and Dentistry- Dr. Kastriot Haxhirexha- Dr. Syheda Latifi Hoxha
14. Education and Development- Dr. Claire Gordon and Dr. Edmond Hajrizi

Due to the figures related to the mentioned disciplines, it seems quite possible to claim that the UBT International Conference is one of the biggest academic events of the Balkan region. Organization of such complicated scientific international conferences with a success is one of the indicators of UBT`s academic capacity.

UBT knowledge Center is the platform that UBT tracks the publications and research outcomes of its academic staff. UBT Knowledge Center was established in 2017, as one of the main pillars of UBT. The aim of the Knowledge Center is capturing data to produce information and create knowledge.

Knowledge Center consists of three essential parts:

- A digital environment to advance local knowledge visibility.
- An organizational environment to enhance boundary crossing collaboration,
- A digital academic library environment to enable discovery of and access to published academic scholarship.

UBT also tracks the publications of academic staff members manually that academic staff are expected to post their publications on a google drive document that the administration can follow up with.

2.1 Scientific research projects and funds

Currently, Kosovo research strategy and challenges are related with the state policy, while as state spends the least on research and scientific activities in the region. Despite the fact that the Law on Scientific Research Activity provides that 0.7% of the annual budget should be allocated to this area, in 2017 only 0.19% of the budget (or 0.05% of GDP) was allocated, while in 2018 around 0.33% of the budget (or 0.1% of GDP).

However, it is expected that this low budget for research and research in Kosovo will change during 2024-2027, with the support provided by the Ministry of Education, through NGO financial support programs, start-up companies, and small and medium-sized enterprises related to research activities.

An important impact at the research is expected by the international, mostly EU Projects where UBT leads in Kosovo, based on the statistics of the Erasmus +. office in Kosovo.

The Energy Engineering program is part of 2 capacity building project, mostly interdisciplinary projects, such as ELEMEND, GEOGIZ etc.

Despite all the support from different departments such as COST ACTION where UBT has allocated even Kosovo on it, UBT has allocated for each department the funds related to its income and research projects. This is related with work for the third part such as laboratory testing, and in this sense should be enhanced.

Within the framework of drafting and implementing a comprehensive and interdisciplinary research platform, UBT aims to position itself as a regional epicenter, generating debate on the key issues of energy engineering development facing contemporary urban societies, and in particular regional and local societies. Research at UBT aims at empowering individual candidates for more in-depth, focused research, integrating theoretical research with innovative experimental research paradigms.

The Research Plan of the Energy Engineering program is part of UBT's institutional research strategy. The main objectives of the strategy are to:

- establish research centers,
- promote the development of research and
- group activities to maximize opportunities for research groups and create the right critical mass
- to increase and build relationships and partnerships with stakeholders in industry, academia and the public sector.

2.2 Scientific research topics

The main topic that will serve as a reference for particular research projects is SUSTAINABILITY in terms of energy engineering, renewable and traditional energy engineering, considering all three of its dimensions: economic, social and environmental.

- Environmental/Ecological Sustainability - beyond the purely physical dimension, including human, economic, social and political;
- Energy Efficiency - from optimal use of large-scale territorial resources and renewable energies to architectural design through active and passive systems;
- Information Technology - as a new paradigm that through experimental methods reform traditional concepts of environmental management, urban design, architectural design and design, introducing advanced models of sustainability.
- Raising employment through faster economic growth. (98 % of Energy Engineering BSc and Energy Engineering and Environment MSc Program, are already employed)

- Improving the quality of education, skills development and innovation. (Memorandum of Understanding with major energy engineering corporates in Kosovo, which enables students to finish their practice based on real time problems. Classroom 3.0, etc.)
- Building the capability of the state to play a developmental transformative role.

Within this general platform, several specific research topics have been identified, as follows:

- Renewable Energy Sources (Solar Systems, Wind Power, Hydro Energy, etc.)
- Energy Storage Technologies
- Efficient Heating & Cooling Technologies
- Advancements in Thermal Insulation
- Co-generation
- Energy Policies and Regulations
- Industrial Energy Efficiency
- Environmental impact of Energy Efficiency
- Building Envelopes & Building Climatology
- Energy Auditing
- Power Systems
- Energy Planning (planning for generation capacity expansions, hydropower planning, network and transmission planning, reliability)
- Waste-to-energy systems
- Energy Systems Operation (Thermal and Hydropower Operation and Optimization, Scheduling, Load Forecasting, Demand-side Management)
- Energy Sustainability as Related to Energy and Power Production, Distribution, and Usage
- Energy Infrastructure Issues (Power Plant Safety, Security of Infrastructure Network)
- Sustainable Power Technologies
- System Reliability and Power Service Quality
- Environmental Issues (Pollution Control and Climate Change)
- Low Carbon Energy

Some of the most important topics will be elaborated in the upcoming sections of the research plan

- Theoretical and applied studies of energy engineering - based on the principle of interdisciplinarity and interaction of similar professions.
- Structural theory - studies focused on the interpretation of structural issues from a theoretical and methodological perspective. Energy Engineering - studies focused on interpreting renewable and traditional energy engineering issues from a theoretical and methodological perspective.
- Information engineering - experimental and innovative research with a systematic and ecological approach, focused on context computing models, design research, prototyping, etc.

Qualified Research Capacities: UBT and international academic / research partners that formalize relationships through agreements recognized by authorities in the respective countries have all the

human, financial, infrastructural capacity to conduct elite scientific research, in addition to resources. internal also from joint projects funded by international projects. Further capacity is complemented through international partners such as: Technical University of Vienna, Austria; EUCEET network, ELEMEND, etc. All of the above indicate that the study program in Energy Engineering has all the human, physical and financial capacity to be a leader in the field.

The program of EnergyEngineering at UBT is basing its research on topics such as

Renewable and traditional energy engineering, with focus on:

- Energy Efficiency and Auditing,
- Sustainable Power Systems,
- Electrical Energy and Energy Markets,
- Energy Engineering and Environment, .

These topics represent an important activity towards the research activities and supporting, sustaining the researchers to meet each other in different events as UBT International Conference on Energy Efficiency Engineering (IC-EEE) or Summer Academies organized every year from the UBT.

Interdisciplinarity is a key component of our research strategy. We focus on preparing our students for real case scenarios through the collaboration with other faculties in specific workshops, classes, study visit, open lectures, etc.

The faculty of EE is building internal multidisciplinary activities between different faculties such as architecture and urban planning, civil engineering and infrastructure, economics and management, information system, and mechatronics to relate these fields to prepare students and researches for their professional future which is becoming more and more interdisciplinary. In this sense, emphasizing the interdisciplinary nature of energy engineering is one of the main aims of the Department, so in this way the problems of this field would be dealt with using an integrated approach. In detail the strategic plan for the research activity is based in these areas.

In addition, UBT and the Faculty of Energy Engineering have signed cooperation agreements with industry representatives in the energy sector, whether public or private. It is worth emphasizing the agreements with the Kosovo Energy Corporation (KEK), the Kosovo Transmission and Trade System Operator (KOSTT), TERMOKOS and the Energy Regulatory Office (ERO). Also from the sector, such as: the Kosovar Energy Distribution Company (KEDS), the Wind Energy Production Company "Air Energy" in Kitka, along with several other companies specialized in the production of electricity from photovoltaic systems. We have also signed cooperation agreements with private companies that deal with the production and implementation of different energy equipment of different voltage levels. Our cooperation also extends to civil society, such as the Association of Women in the Energy Sector in Kosovo (AWESK).

3. Overall research strategy

Energy Engineering - EE research should be of benefit to society and should challenge current practice. The research will contribute to the realization of the United Nations Sustainable Development Goals in areas where energy engineering plays a key role, and in this context we will work with the following research strategy priorities:

- Experimental research, where access to and use of unique research facilities across all disciplines of Energy Engineering is essential.
- Within or through strong strategic cooperation with other EE departments or institutions, nationally or internationally.
- Innovative energy engineering, where EE will challenge the energy engineering profession and develop its purpose e.g. developing new design principles, expanding our technical horizons on sustainability, harmonizing security across disciplines, and developing complex energy engineering that can only be designed and realized with digital technologies.
- Selected strategic research topics that address the long-term challenges and opportunities in society and in the building sector based on Energy Engineering strengths.
- All areas of energy engineering research will develop elements related to the aforementioned departmental strategy priorities.
- We will particularly focus on activities that are within selected strategic research topics.

4. Research topics

The main pillar, such as Sustainable Energy, is supported by this areas:

1. **Renewable and traditional energy engineering,**
2. **Energy Efficiency and Auditing,**
3. **Sustainable Power Systems,**
4. **Electrical Energy and Energy Markets,**
5. **Energy Engineering and Environment,**

4.1 Renewable and traditional energy engineering

4.1.1 Solar energy

The research will be focused more on the following aspects:

- Network integration
- Energy modeling and grid interaction
- Grid support and storage technologies
- Plant performance
- Solar resource assessment
- Measured vs. forecasted performance
- Effects of soiling Module and string mismatching

- Layout optimization
- Dynamic plant modeling
- Performance monitoring
- Technology assessment
- High efficiency thin film vs. S-ci modules

4.1.2 Biomass, bioenergy and waste to energy

The research will be focused more on the following aspects:

- Detailed description of mass and energy flows in biomass conversion
- Sizing of equipment and utilities (capital and operating costs)
- Environmental assessment, e.g. Life Cycle Analysis (LCA, based on mass and energy flows, combined with feedstock supply
- Integrated sustainability assessment (identify viable solutions)

4.1.3 Wind energy

The research will be focused more on the following aspects:

- Off-shore and on-shore wind energy research (esp. support, anchoring, vibrations and power systems)
- Large wind turbines (esp. optimisation, aerodynamics and mechanics)
- Control systems (monitoring, turbine response and safety)
- Network studies from wind energy impact
- Power mechanics
- Modeling and control systems
- Small-scale application

4.1.4 Hydro energy

The research will be focused more on the following aspects:

- Low-Head Hydropower
- Materials and Manufacturing
- Hydropower Systems
- Hydropower Technology Accomplishments
- Pumped-Storage Hydropower

4.1.5 Power/energy systems studies

The research will be focused more on the following aspects:

- Impact of distributed energy resources on the network
- Flexibility on the future grid
- Support services on the future grid
- Operations and maintenance of Eskom-owned RE plants

- Emerging renewable energy applications, e.g. micro-grids or solar thermal desalination
- Spatial planning of renewable energy power plants.
- Integration of various power systems

4.1.6 Energy policy, finance and economics

The research will be focused more on the following aspects:

- Energy and environmental modeling
- Energy finance
- Energy economics
- Energy resources
- Energy and geopolitics
- Environment and climate change .

4. 2. Energy Efficiency and Auditing

The research will be focused more on the following aspects:

- Sustainability of Buildings,
- Energy-efficient Building,
- Energy Performance Improvement,
- Energy Auditing,
- Smart Energy Systems,
- Energy Efficiency Savings Opportunities and Benefits etc.

4. 3. Sustainable Power Systems

The research will be focused more on the following aspects:

- Systems Engineering / Sustainable System Design,
- Sustainable Energy Supply,
- Future renewable based power systems,
- Electric and Hybrid Vehicles,
- Technologies for Sustainable Energy etc,

4. 4. Electrical Energy and Energy Markets

The research will be focused more on the following aspects:

- Renewable energy system (RES) integration in smart grids,
- Advanced power grid analysis,
- Energy market,
- Network security,
- Telemetry and telecontrol, Microgrid technologies etc,

4. 5. Energy Engineering and Environment

The research will be focused more on the following aspects:

- Energy and Environment,
- Sustainable Power Generation,
- Energy Auditing,
- Combined Heat and Power Systems,
- Solar Energy Systems for Buildings and Cities,
- Carbon Management and Storage etc.

5. Research Area

- Renewable Energy Sources (Solar Systems, Wind Energy, Hydropower and Biomass Energy)
- Energy Efficiency and Auditing,
- Energy Engineering and Environment,
- Energy policy, finance and economics,
- Power/energy systems studies,
- Sustainable Electrical Energy System,
- Electrical Energy and Energy Markets

5.1 Renewable Energy Sources

Solar energy

Solar energy is the radiant energy produced in the sun as a result of nuclear fusion reactions (a reaction in which nuclei combine to form more massive nuclei, with the simultaneous release of energy). It is transmitted to the earth through space in quanta of energy called photons, which interact with the earth's atmosphere and surface. The strength of solar radiation at the outer edge of the earth's atmosphere when the earth is taken to be at its average distance from the sun is called the solar constant, the mean value of which is 1.37×10^6 ergs per sec per cm^2 , or about 2 calories per min per cm^2 . The strength of the solar energy available at any point on the earth depends on the day of the year, the time of day, and the latitude of the collection point. Furthermore, the amount of solar energy that can be collected depends on the orientation of the collecting object. Research in the solar energy field has concentrated on both the active and passive solar systems. The main topic of study around solar energy has been the efficiency of the active solar systems and their lifespan. The design of passive solar buildings has also been of keen interests amongst researchers. The Energy Engineering Program BSc and MSc will continue to conduct and facilitate both pure and applied research on active and passive solar systems within and outside UBT.

The research will be focused more on the following aspects:

- Network integration
- Energy modelling and grid interaction
- Grid support and storage technologies
- Plant performance
- Solar resource assessment
- Measured vs. forecasted performance
- Effects of soiling Module and string mismatching
- Layout optimization
- Dynamic plant modeling
- Performance monitoring
- Technology assessment
- High efficiency thin film vs. S-ci modules

Feasibility studies will also be conducted in support of industry and government departments that want to establish the feasibility of undertaking specific projects.

Biomass, bioenergy and waste to energy

Biomass is the organic matter produced by photosynthesis. During photosynthesis, plants convert solar energy into stored chemical energy. Biomass energy comprises fuelwood, twigs, straw, animal dung, vegetable matter and agricultural waste. Processed biomass includes charcoal, methane, sawdust and alcohol produced from fermentation processes. Biomass is renewable as long as the rate of extraction balances the rate of regeneration. Biomass is used either directly or is converted into forms that are convenient for transport and use. For energy purposes, biomass is converted into other forms such as charcoal, gas, ethanol and electricity. Biomass energy conversion technologies range from simple, traditional processes such as charcoal production in earth mounds to modern, highly efficient processes such as power co-generation.

The Energy Engineering Program BSc and MSc, will continue to conduct and facilitate research in the following areas:

- Detailed description of mass and energy flows in biomass conversion
- Sizing of equipment and utilities (capital and operating costs)
- Environmental assessment, e.g. Life Cycle Analysis (LCA, based on mass and energy flows, combined with feedstock supply
- Integrated sustainability assessment (identify viable solutions)

Wind energy

Wind is a form of solar energy. The uneven heating of the atmosphere by the sun, the irregularities of the earth's surface and the rotation of the earth cause winds. Wind flow patterns are modified by the earth's terrain, water bodies and vegetative cover. This wind flow or motion energy can be harvested by modern wind turbines and used to generate electricity.

The Energy Engineering BSc and MSc Program, will continue to conduct and facilitate research on the following aspects:

- Off-shore and on-shore wind energy research (esp. support, anchoring, vibrations and power systems)
- Large wind turbines (esp. optimisation, aerodynamics and mechanics)
- Control systems (monitoring, turbine response and safety)
- Network studies from wind energy impact
- Power mechanics
- Modeling and control systems
- Small-scale application

Hydro energy

Hydroelectricity is based on simple principles of using falling water to spin a shaft connected to an electric generator; the greater the fall of water, the greater the power to spin the shafts that are used to drive electric generators. Hydroelectric power is the oldest form of renewable energy. Hydroelectric power, or “hydropower” as it is called, involves electricity generated by the force of moving water as it flows through a turbine. The water flows from a higher elevation to a lower elevation. The turbines are connected to electrical generators, which produce the power. Hydropower involves no emissions during the generation process. The energy generated is essentially derived from the sun and therefore is inherently renewable. Energy from the sun causes evaporation from the lakes and oceans and the water returns to the earth by precipitation. Hydroelectric power plants thus capture the energy released by water falling through a vertical distance and transform this energy into useful electricity. The rotation of the water turbines is transferred to a generator that produces electricity. The volume of the water and the distance of the vertical drop are critical factors in determining the quantity of electricity generated.

The Energy Engineering BSc and MSc Program, will continue to conduct and facilitate research on the following aspects:

- Low-Head Hydropower
- Materials and Manufacturing
- Hydropower Systems
- Hydropower Technology Accomplishments
- Pumped-Storage Hydropower

5.2. Energy Efficiency and Auditing

Increasing energy efficiency (EE) and renewable energy (RE) are fundamental components of the World Bank Group's engagement in the energy sector and are key to helping Kosovo achieve greater energy security. The country has significant potential to improve energy efficiency and integrate renewables into its energy supply mix.

The World Bank has supported Kosovo through a \$31 million project for Energy Efficiency and Renewable Energy of Kosovo, the aim of which has been to reduce energy consumption and the use of fossil fuels in public buildings. Through this investment, the Bank also supports Kosovo in improving the policy and regulatory environment for renewable energy and energy efficiency.

Energy efficiency investments in the public sector can significantly reduce energy costs, creating fiscal space for other development priorities, increasing competitiveness and job creation. International experience has shown that investments in energy efficiency in the public sector can help catalyze energy efficiency markets, allowing governments to lead by example and pave the way for similar improvements in the private sector.

A 2013 World Bank market assessment in Kosovo revealed that the construction sector accounts for 48% of final energy consumption and has an energy efficiency potential of around 44%. Public buildings showed the highest savings potential, with 38-47% in municipal buildings and up to 49% in central government buildings. Such energy savings can contribute to significant budget savings for the Government of Kosovo and enable other necessary investments in the economy.

However, a major obstacle to the development of renewable energy for the public and private sectors in Kosovo has been the underdeveloped regulatory regime and the lack of complete and reliable data on resources. Regulatory improvements, together with selected renewable energy assessments and feasibility studies, should be supported in areas not covered by other donors and in line with Kosovo's renewable energy development plan.

Central and municipal governments will benefit from the Kosovo Energy Efficiency and Renewable Energy Project through reduced energy costs, renovated building stock and improved indoor comfort and functionality. The Ministry of Economic Development, the Ministry of Environment and Spatial Planning, the Kosovo Energy Efficiency Agency and the Energy Regulatory Office will develop their capacities to promote sustainable energy investments throughout the country.

Kosovo's private sector will also benefit in several ways. An improved regulatory environment is expected to facilitate faster licensing and greater market penetration for renewable energy development. Suppliers and service providers of renewable energy and energy efficiency equipment are expected to benefit from increased demand for their goods and services. For example, by modernizing and reducing energy use in universities and hospitals, students and patients will benefit from improved levels of comfort, functionality and reduced air pollution.

Going Forward

Investing in energy efficiency in public buildings can save the public budget. Energy efficiency also helps Kosovo increase energy security by reducing seasonal energy imports, creating local jobs, reducing local and global pollution and helping to meet commitments under the EU Energy Community Treaty. The World Bank has also worked with the Government of Kosovo and the European Commission to establish and secure funding for the new Energy Efficiency Revolving Fund to support energy efficiency improvements in public municipal buildings.

Ensuring a reliable and affordable supply of electricity in the country is a high priority for the Government of Kosovo and a necessity for economic growth. However, the country is facing major challenges from the increase in demand for electricity and heating, while the existing power plants have limited capacities and are showing obstacles in supply. Currently, the percentage of electricity produced by old and inefficient lignite plants is very high, causing high levels of pollution.

For Kosovo, increasing EE is an important goal. As a member of the EU Energy Community, the country is committed to implementing the energy chapter of the EU acquis. Therefore, by 2030, the Government of Kosovo aims to reduce energy consumption by 32.5 percent compared to forecasts, in the direction of the EU's energy efficiency objective.

The project improves the capacities of relevant actors for the efficient implementation of Energy Efficiency (EE) measures. Central level institutions and municipalities have successfully improved the normative and regulatory framework for the development of the EE sector. This includes national building standards and other mechanisms such as sustainable municipal energy planning, a system for energy auditing and the energy certification of buildings, inspection of heating, ventilation and air conditioning (HVAC) systems, and energy management.

Approach

To tackle the challenges and achieve the objectives mentioned above, the project:

Supports the national EE Agency (KEEA) in improving the normative and regulatory framework for the implementation of EE measures, with an additional focus of coordinating the developing process of an integrated energy and climate plan;

Increases the capacities of EE service providers such as energy auditors and energy managers by establishing private and public academic institutions and providing training programmes for energy service providers;

Introduces EE instruments in selected municipalities that enable the planning and prioritisation of EE measures in municipal EE action plans as well as the implementation and monitoring of these plans; Enhances technical and political dialogue on Energy Transition by establishing a regular exchange of relevant actors from politics, civil society, academia and the private sector.

Results

The professional exchange with municipalities spreads the gained experiences to conduct EE planning, implementation and monitoring nationwide. Local authorities and municipal energy managers are now able to carry out these tasks.

Finally, a close cooperation with the government and civil society such as Kosovo Sustainable Development Week (KSDW) which motivated the creation of the Network for Clean Energy Businesses, today serves as a dialogue exchange to strengthen the relevance of the country's energy transition.

Energy Efficiency and Auditing, with focus in: Sustainability of Buildings, Energy-efficient Building, Energy Performance Improvement, Energy Auditing, Smart Energy Systems, Energy Efficiency Savings Opportunities and Benefits etc. Considering that 65% of electricity in Kosovo is used by residential buildings, specialization in Energy Efficiency and Auditing, will contribute to increasing efficiency in residential and industrial buildings, with a focus on those residential buildings.

5.3. Energy Engineering and Environment

Energy Engineering and Environment with focus in: Energy and Environment, Sustainable Power Generation, Energy Auditing, Combined Heat and Power Systems, Solar Energy Systems for Buildings and Cities, Carbon Management and Storage.

5.4. Energy policy, finance and economics

Energy policies form an important and integral part of renewable and sustainable energy research and development activities. The energy sector is always viewed from demand and supply perspectives. The Kosovo energy sector has historically tended to promote policies that predominantly address supply-side issues, without necessarily looking at the various demand sectors. In Kosovo, the demand side is generally analysed in terms of the energy requirements of households, industry, commerce, mining, transport and agriculture. Supply subsectors include coal, and renewable energy systems. From a policy perspective, social problems can arise in both the demand and supply sub-sectors. Identifying the causes of these problems can be difficult. Causal linkages may extend beyond the energy sector. Energy policies therefore must be carefully coordinated with other social sectors and also be coordinated between energy sub-sectors. To cope with multiple causal linkages, energy policy analysis usually commences with the demand side by means of a process known as 'integrated energy planning'. This process recognizes that energy is not an end, but is rather consumed as a means to an end. Policy must facilitate optimal energy consumption and production to meet social needs. This requires consumer choice and the operation of market forces. Above all, the energy policy formulation sector requires appropriate technical

data to inform policy makers. The Energy Engineering BSc and MSc Program, is well positioned to assist with the policy formulation process, either directly through active participation in government committees that deal with policy formulation, or indirectly through human capacity development in the policy formulation space. Finance is defined as the system that includes the circulation of money, the granting of credit, the making of investments, and the provision of banking facilities, as well as the science or study of the management of funds. Economics studies how individuals, businesses, governments and nations make choices on allocating resources to satisfy their wants and needs and tries to determine how these groups should organize and coordinate efforts to achieve maximum output. Macroeconomics: concentrates on the behavior of the aggregate economy.

Microeconomics: focuses on individual consumers

The Energy Engineering BSc and Energy Engineering and Environment MSc Program, will continue to conduct feasibility studies that include the financial and economic feasibility of renewable energy projects in general.

The research will involve the following aspects:

Energy and environmental modeling – energy and environmental planning, modeling, and forecasting.

Energy finance – oil price risk and financial contagion, financialization of energy futures markets, oil price drops and commodity markets, and portfolio optimization including energy/commodities derivatives.

Energy economics – economic development and energy prices under different market conditions, energy shocks and economic growth in developed and developing countries, oil markets and macroeconomy, regulations and taxation and subsidies in energy markets and the macroeconomy, electricity supply and demand functions, global and regional trade of energy products, and monetary and fiscal policies in oil-exporting countries.

Energy resources – bioresources (e.g., biomass, waste), fossil fuels (including natural gas), geothermal, hydrogen, hydropower, nuclear, marine and ocean energy, solar and wind, energy resources and sustainable development in developing economies, and energy efficiency and conservation.

Energy and geopolitics – energy supply security, strategic petroleum reserves and oil prices, and discretionary income effect of oil price shocks.

Environment and climate change – transition towards a low carbon economy, green growth indicators, sustainable and responsible investing, mobilizing bond markets for a low-carbon transition, tackling environmental problems with the help of behavioral information, sectoral environmental policy impact analysis, sustainable and renewable energy supply chains, economic,

social, energy and environmental aspects of transportation, energy and environmental cost of urbanization and industrialization, energy and environmental issues, energy use and climate, energy and environmental aspects of financial development and tourism, health issues, global biodiversity financial gap (financing nature), environment and climate, trade, development, and monetary policy, fiscal policy to address energy-related to environmental impacts.

5.5. Power/energy systems studies

Electrical power system studies involve power system modeling and network simulation in order to analyze electrical power systems using design/offline or realtime data. Power system simulation software is a class of computer simulation programs that focus on the operation of electrical power systems.

The research in power systems studies will involve the following aspects:

- Impact of distributed energy resources on the network;
- Flexibility on the future grid;
- Support services on the future grid;
- Operations and maintenance of Eskom-owned RE plants;
- Emerging renewable energy applications, e.g. micro-grids or solar thermal desalination;
- Spatial planning of renewable energy power plants;
- Integration of various power systems.

5.6. Sustainable Electrical Energy System

Sustainable Electrical Energy System, with focus in: Systems Engineering / Sustainable System Design, Sustainable Energy Supply, Future renewable based power systems, Electric and Hybrid Vehicles, Technologies for Sustainable Energy etc, This specialisation will contribute to analyse the performance of systems for transmission, distribution, and storage of electrical energy, design a future renewable system, design of smart grid solutions for sustainability problems.

5.7. Electrical Energy and Energy Markets

Electrical Energy and Energy Markets with focus in: Renewable energy system (RES) integration in smart grids, Advanced power grid analysis, Energy market, Network security, Telemetry and telecontrol, Microgrid technologies.