TECHNICAL UNIVERSITY
OF CRETE

Research & Technology Innovation at TUC

> *Research is a core mission of the Institution and as a result, TUC delivers scientific output of high calibre and volume. In terms of research publications, TUC is one of the most productive research institutions in Greece and compares very favourably with peer institutions in Europe and North America*

With these words, the External Evaluation Report of the Technnical University of Crete by the Hellenic Quality Assurance & Accreditation Agency (H.Q.A)., confirms the high-level research produced by TUC.

At the ShanghaiRanking's Global Ranking of Academic Subjects, for the year 2017, the Technical Univeristy of Crete, ranked 151-200 in the subject of Civil Engineering and for the year 2016 ranked 201-300 in the subject area of Electrical & Electronic Engineering. In addition, TUC ranked 31st in the list of the world's best universities for Oil, Gas, and Petroleum Engineering, according to the results of the 2017 CEOWORLD magazine university rankings. For the year 2015, in the QS World University Rankings by Subject category, TUC's School of Environmental Engineering ranked 251-300, for the Environmental Sciences. The rankings highlight the world's top universities, based on academic reputation, employer reputation and research impact. Finally, TUC was listed among the top 400 Universities in the world, according to QS World University Rankings by Faculty 2014 in Engineering & Technology.

The Technical University of Crete is particularly active in conducting basic and applied research.The Research and Development projects, managed by the Research Committee, are funded by the European Union, the General Secretariat for Research and Technology, the Ministry of Education, the Region of Crete, local administration organizations and many private businesses. A large number of TUC undergraduate and postgraduate students are employed in these projects; in this way, they benefit from the best possible training and they familiarize with conducting research.

Through the expertise in Research & Development in the areas of environmental engineering, electrical & computer engineering, architectural engineering, mineral resources engineering, production engineering and management and others, TUC laboratories & research groups have developed various applications and unique products, designs, processes, and inventions, some of which are highlighted in this booklet.

School of Production Engineering & Management

Dynamic Systems and Simulation Laboratory (DSSL)

Site: www.dssl.tuc.gr/en

Short Description: The Dynamic Systems and Simulation Laboratory (DSSL) was established in 1988. The staff of DSSL includes about 15 professors, lecturers, researchers, graduate and undergraduate students and has profound knowledge and broad experience in the theories of modelling, simulation, optimisation, automatic control, and their practical application to traffic and transportation systems, water networks, production systems, and further areas. DSSL has been involved in numerous research, development, and demonstration projects at a national, European, and international level. DSSL has gained a remarkable experience through the implementation in real conditions, the testing, and the evaluation of its several techniques and tools in various European and non-European sites.

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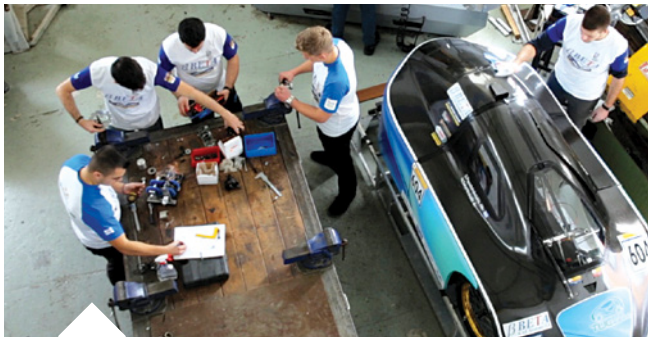

TUC Eco Racing team

Site: www.tucer.tuc.gr/en

Short Description: TUCer (Technical University of Crete Eco Racing) team studies, designs and develops:

Prototype, green, zero emission urban vehicles, powered by hydrogen fuel cells or batteries at TUC, since 2007. The prototype cars participate continuously in Shell Eco Marathon since 2008. TUCer is the only Greek team to participate in the urban concept category of the competition.

Daedalus, a bespoke prototype electric motorcycle with integrated innovative systems and exceptional aesthetics, targeting the construction of a high tech transportation vehicle, featuring a three wheel design. Daedalus is a 2018's project, aiming to form a new sport-touring category and will stand out for its design, ground breaking technologies and specifications, compared to current products.

TUCerOUS, an electric prototype car equipped with a state of the art sensor suite and intelligent software, designed to operate as a platform for research and development at the area of autonomous navigation.

TUCer is supported by the Machine Tools Laboratory and the Intelligent Systems & Robotics Laboratory of the School of Production Engineering and Management. The team is set up by professors, research personnel and students. The structure of the team follows a professional team management, organized in smaller groups which cooperate to achieve product optimization of every single vehicles' part. All members of the team participate voluntarily.

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Micromachining & Manufacturing Modeling Lab – m3

Site: www.m3.tuc.gr

Short Description: Micromachining and Manufacturing Modeling Lab (m3) was created in 2010 in order to cover the educational and research needs in advanced manufacturing fields, and micromachining in particular. In addition, the m3 supports manufacturing subjects of mechanical engineers in general, such as machine elements. m3 lab provides advanced scientific knowledge to students, while being actively involved in research collaborations with other Universities and Research Institutions, and promoting collaborations with enterprises for the resolution of practical problems. The research fields where m3 is actively involved, or provides services via the Special Research Fund Account of the Technical University of Crete, are:

- Simulation of manufacturing processes
- Microtechnologies
- CAD/CAM/CAE
- Finite elements method analysis for production technologies
- Reverse engineering and
- Specialized subjects of bioengineering and nanotechnology.

The research conducted at the m3 Lab involves theoretical development and applications of manufacturing processes and especially Gear Cutting, Face and Peripheral Milling, Turning, Drilling and Laser engraving. m3 is engaged in the development of a wide range of optimization procedures for the above processing technologies. The research and educational activities of the Laboratory have been funded by several grants obtained from the European Union, the Greek Government, financial institutions and private companies.

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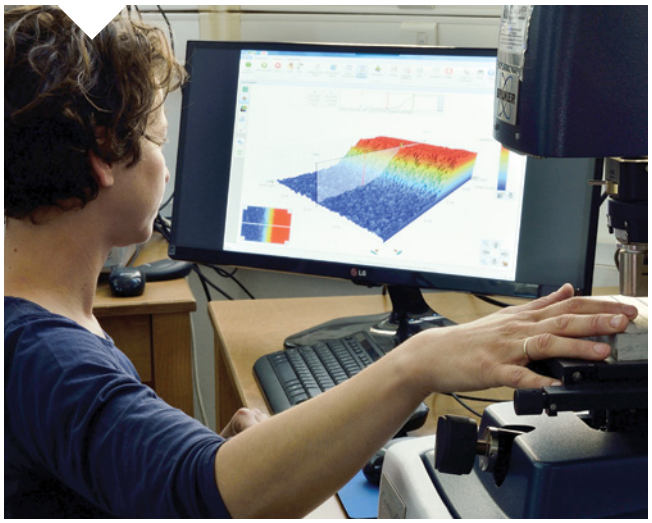

School of Mineral Resources Engineering

Laboratory of Geodesy and Geomatics

Site: www.geomatlab.tuc.gr

Short Description: The Laboratory of Geodesy and Geomatics Engineering (GeoMatLab) undertakes world-class research on Geodesy, Satellite Geodesy (Global Navigation Satellite Systems), Satellite Altimetry, Precise Geodetic Positioning, Underwater Positioning, Remote Sensing, Image Analysis, and Data Analysis. GeoMatLab is pioneer in calibrating American, European, French, Indian, and Chinese altimetry missions. It has established a network of permanent GNSS monitoring stations in west Crete and Gavdos for more than 15 years for tectonic deformation, atmospheric delay and satellite signal monitoring, among of which are sites of EUREF, EGNOS, and Chinese BeiDou stations.

On behalf of the European Space Agency, GeoMatLab operates its unique international research infrastructure for the Calibration and Validation of satellite altimetry in west Crete, by diverse techniques, instrumentation and settings (land, sea surface, transponder, tide gauges, etc.). More than 15 years, the Lab has established strong ties with American, European, French, Chinese, Indian, Brazilian, and Japanese Space Agencies as this infrastructure constitutes the world mainstay for calibrating all international altimetry satellites on metrology and absolute reference standards and measurements. It contributes to setting the standards for absolute, continuous and long-term climate change and sea level monitoring.

The Lab is active in monitoring natural disasters, such as tectonic deformation for earthquake research, ground subsidence after groundwater depletion, structural deformation, but also in environmental remote sensing (oil-spill, forest-fire detection, rock-fall and landslide monitoring, ground subsidence), satellite signal monitoring, troposphere and ionosphere monitoring, satellite signal quality control, etc.

Research Areas: Precise Positioning, Global Navigation Satellite Systems, Satellite Altimetry Calibration, Data Analysis, Quality Control, Underwater Positioning and Remote Sensing.

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Research Group of Spatial Informatics (SenseLab)

Site: www.senselab.tuc.gr

Short Description: The Research Group of Space Informatics (SenseLab), is devoted in providing research and education in the areas of Geographic Information Systems (GIS) and Space informatics including Satellite Remote Sensing, Photogrammetry and Unmanned Aerial Systems (UAVs - drones) in the Technical University of Crete. SenseLab comprises of more than 30 multi-disciplinary undergraduate and postgraduate students that besides drones implement algorithms, tools, products or theory on Location-based services, tangible GIS, gestural interfaces, spatial database querying, satellite image processing, cognition, spatiotemporal data management, visualization, etc. SenseLab managed to become a world leading Research Group in the areas of UAVs and Geoinformatics, which is certified by a series of prestigious international awards and distinctions during highly competitive contests including: 2017 Space Oscars, Tallinn, 1st globally, 2016 European GNSS Service (GSA), 1st place globally, 2016 ESNC Satellite masters, 2nd overall winners, (400 teams), Madrid, 2016 UAE Drones for Good (1st in EU and 3rd internationally between 1017 applicants from 165 countries), Dubai, 2016 DJI drones Developer Challenge (short-listed), USA, 2015 Copernicus Masters NCMA, 1st winner in Remote Sensing visualization, Berlin, 2015 European Space Agency App Challenge.

Research Areas:

- Unmanned Aerial Vehicles for mapping/ communication/ collision avoidance/ on-board processing/ vision/ real time
- Graphical user interfaces in spatial databases/ queries by sketch/ gestural user interfaces
- Spatiotemporal data modeling/ topology/ scene similarity/ trajectory behavioral analysis,
- Multi-temporal satellite image processing/ classification novel algorithms/monitoring applications,
- GIS tangible systems/ 3D Visualization
- Earth Observation, Environmental monitoring, mining, agriculture, global change
- Optimization of belt conveyor location in mines/ Image processing in mineral liberation
- Mapping, monitoring and 3D modelling in urban settlements, engineering structures, archaeological sites, land formations, industrial equipment - ships, etc.
- Location based services/ pipeline urban protection/ e-Government applications, rock fall monitoring
- Archaeology, cultural heritage and history

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Hydrocarbons Chemistry & Technology research unit

Site: www.hydrocarbons.tuc.gr

Short Description: The "Hydrocarbons Chemistry & Technology" research unit performs geochemical studies, providing detailed analyses of crude oils and potential source rocks. The main objectives of the team's work are: analysis and interpretation of biomarkers in crude oils and sediments, rock-eval – total organic carbon analysis, CHNS-O analysis, characterization of the depositional environment, evaluation of petroleum generation potential, maturity, degree of biodegradation, oil-oil and oil-source correlations, environmental analysis. One of the basic research directions is the instrumental analysis and the characterization of fossil fuels (oil, natural gas, coal etc.). During the last years the team has been involved in many projects dealing with the analysis and characterization of organic pollutants in the environment, produced during production and use of fossil fuels. In environmental studies, a series of chemometric techniques are employed for the identification and characterization of petroleum derived pollutants (fingerprinting).

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Research Unit 'Technologies for management of mining/metallurgical wastes and rehabilitation of contaminated soils'

Site: www.mred.tuc.gr/index.php?id=4250

Short Description: The Laboratory of Waste Management and Soil Decontamination under the supervision of Prof. Konstantinos Komnitsas, has been involved in the implementation of many projects funded from national and international sources in the fields of raw materials management, hydro- and bio-hydrometallurgy, waste management and valorization, new materials, soil decontamination, environmental risk assessment and LCA studies. Recent projects involve among others H2020 and Life. It is a very well equipped laboratory with several types of reactors, furnaces, analytical equipment and software to carry out complete studies in reactor design, leaching, environmental issues and waste valorisation. The Laboratory uses also the equipment of the other two laboratories Prof. Komnitsas supervises, namely the Ceramics and Glass Technology lab and the Ore Beneficiation lab. In these three labs several theses including diploma, MSc and PhD are carried out while several researchers are involved in project implementation. Three permanent research associates (PhD holders) are also involved in supervision of students and researchers. Prof. Komnitsas has published more than 95 papers in peer-reviewed journals that have been cited over 1850 times and his Scopus h-index is 24 (Google Scholar h-index=28).

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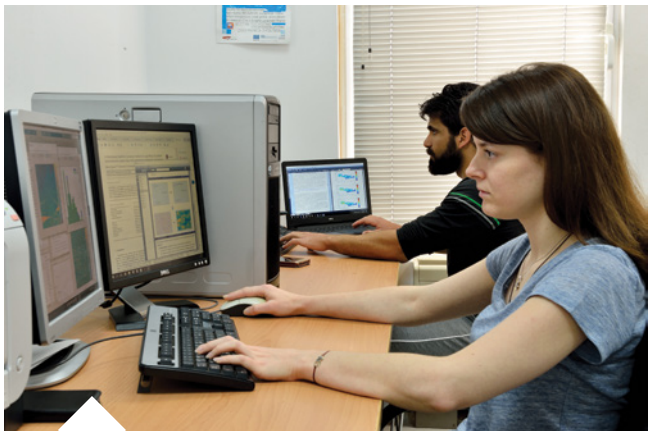

Geostatistics Laboratory (GSLAB)

Site: www.geostatistics.tuc.gr

Short Description: GLSAB's goal is the analysis of spatial and spatiotemporal data by means of novel methods and algorithms that are often developed by lab members. Our approach is interdisciplinary and combines elements from geostatistics, statistical physics, applied mathematics and machine learning.

GSLAB has expertise in the following areas:

- Development of novel methods for spatial and spatiotemporal data analysis
- Fast algorithms for reconstruction of missing data
- Interpolation and simulation of scattered spatial and spatio-temporal data
- Numerical and theoretical models for random media
- Stochastic models of kinetic and transport processes
- Statistical models of recurrence times for extreme events such as fractures and earthquakes
- Applications of statistical physics to environmental problems

Some recent applications include the following:

- Quantitative analysis of groundwater level variability
- Stochastic estimates of fossil fuel reserves
- Statistical models of seismic risk assessment
- Analysis of GPS time series to detect the response of buildings to wind loads
- Environmental risk assessment based on geostatistical data analysis
- Mapping of radioactivity dose rates over the European continent
- Spatiotemporal analysis of precipitation patterns
- Statistical models of mechanical strength, fracture, and earthquake recurrence times
- Causal analysis of information flow in the brain based on EEG data analysis

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School of Electrical & Computer Engineering

Digital Signal & Image Processing Laboratory (DISPLAY lab)

Site: www.display.tuc.gr

Short Description: The Digital Image and Signal Processing Laboratory (DISPLAY) of TUC is involved in research on signal/image processing, analysis and data mining with applications in biomedical data analysis, imaging systems and integrated automation systems. Some of the latest laboratory's research interests are: Video Surveillance and Monitoring Applications (including Environmental Monitoring & Early-Detection Systems, Real time video transmission over networks), Geometric Growth Models (especially modeling of Cancer-Glioma Evolution), Biological and Biomolecular Signal Exploratory Analysis (with electro-physiological signal (EEG) Processing, Genomic Analysis, Gene Interaction Networks). Highlighting a few multidisciplinary aspects, research in the DISPLAY lab attempts to associate the biomedical aspects of signal and image processing with the areas of genomic analysis for personalized diagnosis, prognosis, and medicine and therapy treatment. Particular issues of instability in stochastic pattern recognition approaches are treated by exploiting concepts of data bootstrapping, permutation and stabilization for ensuring the regularization and generalization of machine learning algorithms.

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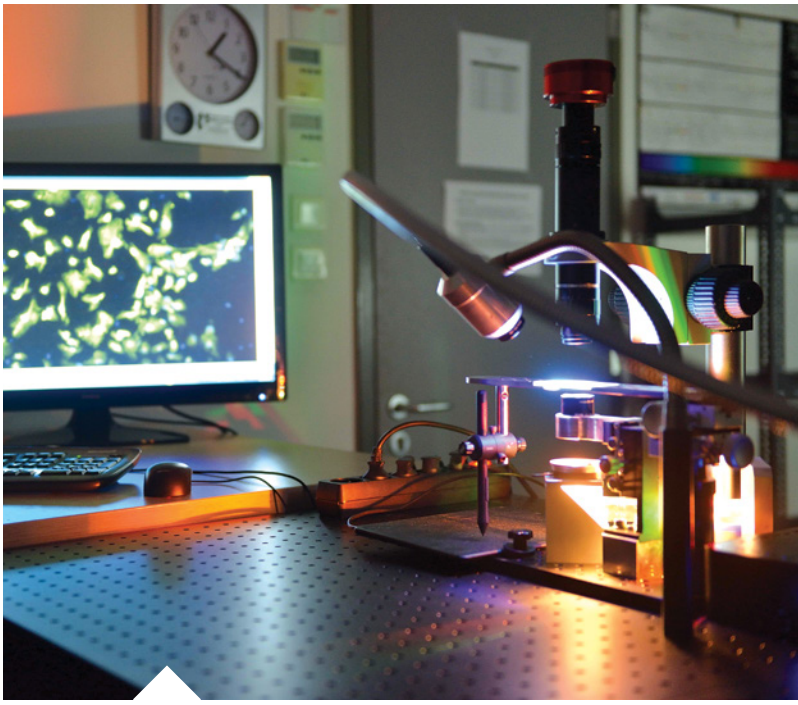

Electronics Laboratory

Site: www.electronics.tuc.gr/en

Short Description: The activities of the Electronics Laboratory include research, development, training and technology transfer in the fields of optoelectronics and micro- nano- electronics. The Lab's research activities are focused in Hyper-Spectral imaging instrumentation and data analysis, optical molecular imaging, biophotonic medical diagnostic devices, high frequency microelectronics, CMOS design and modeling. The Electronics Laboratory is equipped with state-of-the-art instrumentation for design, simulation, layout, prototyping, characterization and testing of optoelectronic and microelectronic systems and devices. The lab members have succeeded in establishing long-term collaborations with internationally reputable academic and industrial institutions and in attracting funds from research grants and through technology and know-how transfer contracts to leading industries in the fields of opto- and micro-electronics.

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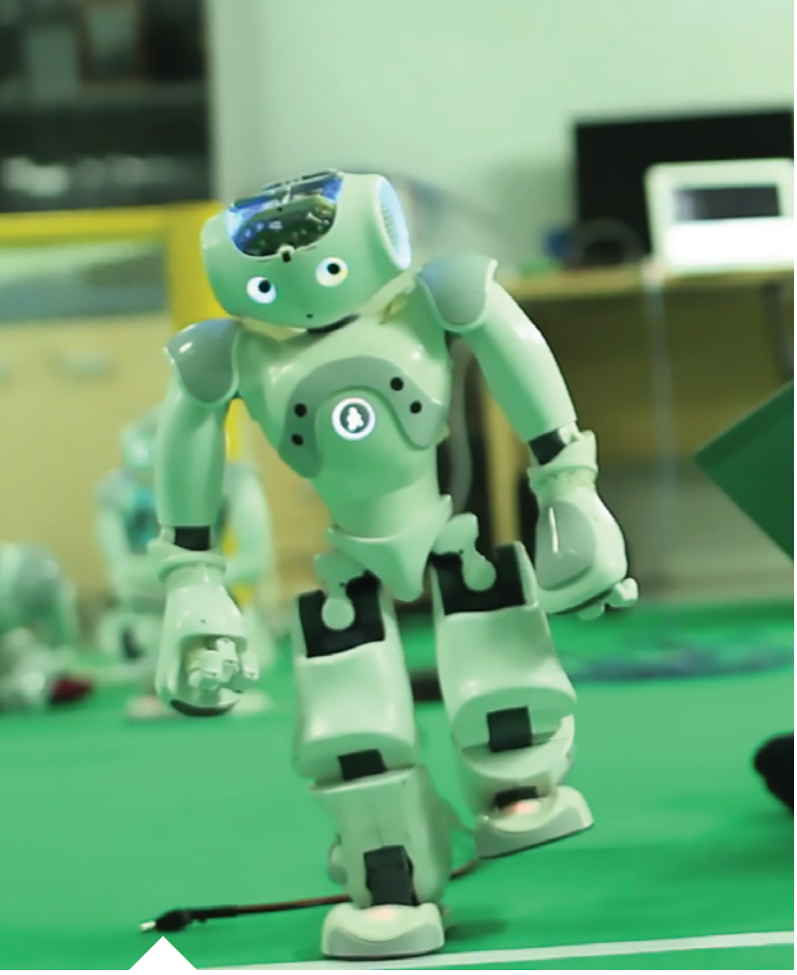

Intelligent Systems Laboratory (InteLLigence)

Site: www.intelligence.tuc.gr

Short Description: The Intelligent Systems Laboratory (InteLLigence) is a unit of the ECE School. The role of this laboratory is to educate undergraduate and graduate students in the concepts and techniques of modern Intelligent Systems and to carry out cutting-edge research in this area. Current research work spans many areas, such as Multimedia and Web information systems, Semantic Web, Machine Learning, Robotics, Bioinformatics, Computer vision, Peer-to-Peer computing and Intelligent Agents. The laboratory is funded by the Technical University of Crete and various Greek and European funding institutions.

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Laboratory of Distributed Multimedia Information Systems & Applications TUC/MUSIC

Site: www.music.tuc.gr

Short Description: TUC/MUSIC Laboratory was established in 1990 in the School of Electrical and Computer Engineering of TUC. It is a center of research, development and education in the areas of distributed information systems, distributed multimedia architectures, Virtual/Augmented reality and 3D graphics, human computer interaction, visualization, large-scale web information systems. The laboratory supports a set of undergraduate and postgraduate courses in the areas mentioned above, as well as in system and application programming and databases.

Research areas: high performance distributed multimedia architectures, information systems offering advanced functionalities, data base systems, information retrieval systems, digital libraries, service oriented architectures, large distributed multimedia delivery networks for intelligent TV applications, semantic interoperability infrastructures, 3D graphics, Virtual/Augmented reality, perceptual rendering, displays and haptics, multi-modal interfaces, data visualization, web and mobile based application development methodologies, natural language processing, as well as standard-based software infrastructures for multimedia applications in areas such as e-learning, culture and tourism, business applications, TV Applications and medicine.

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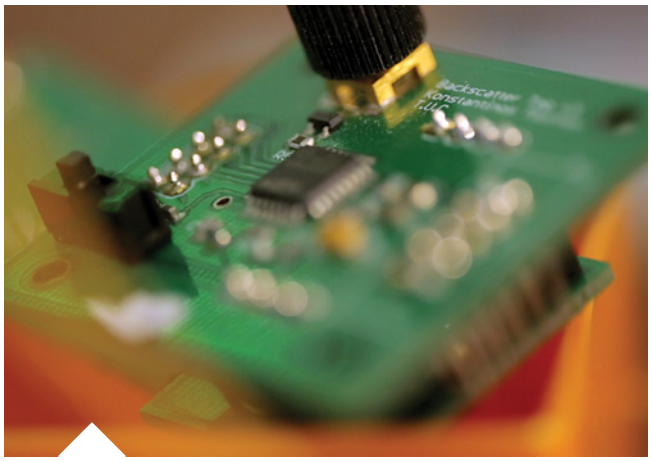

Software Technology and Network Applications Laboratory | SoftNet

Site: www.softnet.tuc.gr

Short Description: The Software Technology and Network Applications Laboratory is a center of research and teaching software systems' technology and network applications. The research and teaching activities of the laboratory include operating and distributed systems, sensor networks, continuous data streams, large and distributed databases, and topics in algorithms and complexity. The SoftNet laboratory has also developed and offers consulting services for several open-source software packages for research and teaching.

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Telecommunications Laboratory (TUC/TELECOM)

Site: www.telecomlab.tuc.gr

Short Description: The Telecommunications Laboratory conducts research in digital communications, wireless communications and networking, signal processing for communications, and machine learning. The lab supports the School's educational mission in the telecommunications area. It has significant computational resources, microwave measurement equipment (including vector network and spectrum analyzers), rapid printed circuit board (PCB) prototyping facility (including CNC etching, pick-and-place and reflow ovens), pilot embedded radio network, custom software-defined reader for RFID and a pilot testbed activity in Software Defined Radios (SDRs) and cognitive radio. Lab faculty have a steady research presence in IEEE Transaction Editorial Boards and Conference Technical Program Committees (TPC) and have been awarded two IEEE best journal paper awards and six IEEE best conference paper awards and distinctions, in addition to several other international distinctions.

Research Areas: Wireless communications and networking, short packet wireless communications, noncoherent receiver design with low-complexity, batteryless ultra-low power wireless sensors, backscatter radio and RFID, RF and bioelectric energy harvesting, CDMA code design, sensor array processing and beamforming for multi-antenna reception and transmission, perturbation theory and applications in performance analysis of communication systems, computational geometry and applications in CDMA, space-time processing, multi-way analysis and applications in signal processing and machine learning, development and implementation of parallel algorithms for multi-way analysis, source separation and localization of multiple radio signals.

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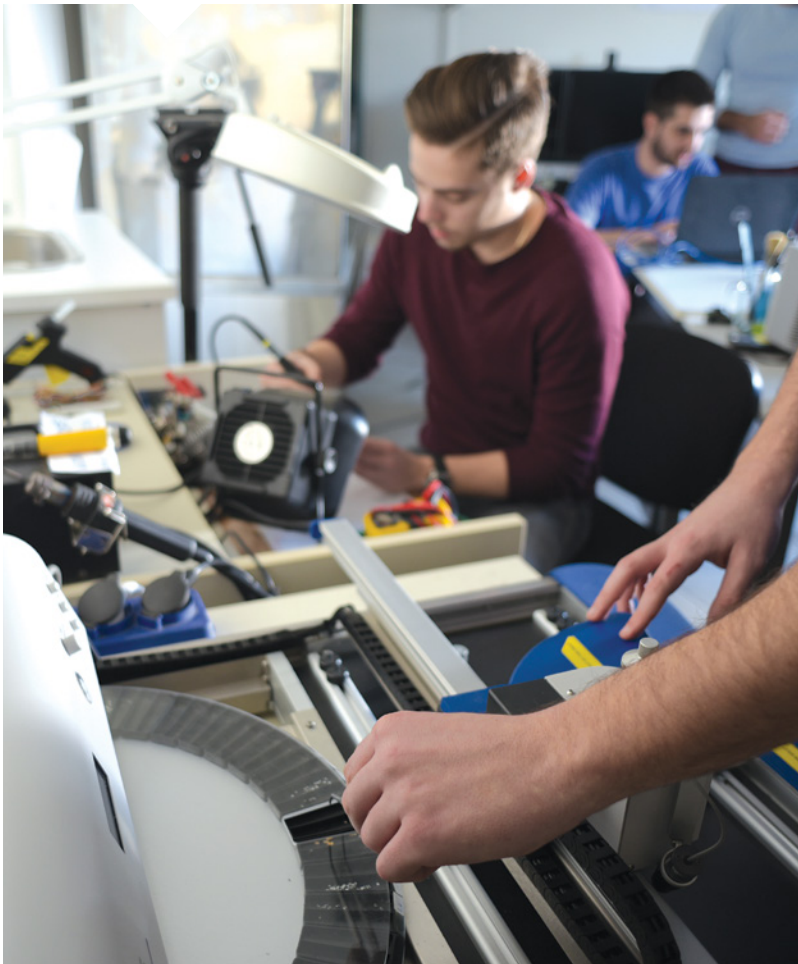

School of Environmental Engineering

Toxic and Hazardous Waste Management Laboratory

Site: www.enveng.tuc.gr/pdf/labs/Template_labs_htwm-en.pdf

Short Description: The Laboratory of Toxic and Hazardous Waste Management focuses on the development of advanced technologies, the promotion of scientific research and transfer of knowledge in the field of hazardous waste management. Research in the lab involves hazardous waste treatment using physicochemical, biological and thermal methods, safe disposal on special hazardous waste landfills, waste management and recycling, as well as the remediation of contaminated soil and groundwater. Other areas of interest in the Laboratory include hazardous waste treatment using feasible and economically beneficial solutions for Greek "reality". In the framework of an integrated hazardous (and not only) waste the Laboratory aims at the development and design of management programs. The upper goal is the minimization of the produced waste either by source and waste volume reduction or by recycling. For the remediation of soil and groundwater contaminated by inorganic (mostly heavy metals) and organic (mainly petroleum products) contaminants, the Laboratory focuses on innovative restoration technologies (air sparging, bioslurping, bioventing, PRB, and others).

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Biochemical Engineering and Environmental Biotechnology Laboratory

Site: www.beeb.enveng.tuc.gr

Short Description: The laboratory of Biochemical Engineering & Environmental Biotechnology (BEEB) is one of the few laboratories involved in the development of biological-based processes to address environmental problems in Greek Universities. The laboratory was established in 1997, a few months before the Department accepted its first undergraduate students and belongs to Division: "Analysis and Design of Environmental Processes". The BEEB Laboratory has become one of the premier centres of excellence and innovation in Greece and Southern Europe for Research and Development of novel biotechnological processes for environmental protection, quality assessment and remediation of contaminated sites and the marine environment. In addition, it has established collaborative research projects with other laboratories at National, EU and International level and provides external services on a contractual basis for environmental sample analysis and/or bioremediation or phytoremediation process design & monitoring. The laboratory has participated in many National and EU (FP5, FP6, FP7, H2020, LIFE, EEA) projects and has established collaborations with many laboratories in EU and worldwide. The primary focus of the laboratory is remediation of hydrocarbon contaminated sites (terrestrial & marine), biodegradation of marine litter (plastics and microplastics), and constructed wetlands for tertiary treatment of micropollutants.

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Energy Management in the Build Environment Research Laboratory (EMBER)

Site: www.ember.tuc.gr

Short Description: EMBER is focusing on applied research in the following topics: Energy efficiency in buildings and built environment, Indoor Environmental Quality and Energy Efficiency, Thermal Comfort, Visual Comfort and Indoor Air Quality, Performance indicators, Green Buildings, Zero carbon emissions buildings, Urban environment and Climate Change, Urban heat island studies and urban heat island mitigation techniques, Energy Management Systems, Monitoring and Control of indoor environmental conditions, Design and integration of smart systems in buildings and urban environment. The Laboratory staff is involved in various EC and national projects such as FP7-ICT project 'PEBBLE' targeting to zero energy buildings, the FP7-ENVIRONMENT project 'BRIDGE' aiming to improve the urban environment via the anticipation of the urban heat island the IEE project "Promotion of Cool Roofs in EU", the Green@Hospital CIP project, the Horizon Marie Curie Project SMART GEMS, etc.

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Hydrogeochemical Engineering and Soil Remediation Laboratory

Site: www.herslab.tuc.gr

Short Description: HERSLab conducts research on water quality management at the watershed scale, the development and use of hydrogeochemical watershed, surface and ground water models, sustainable development of water resources, assessment and remediation of soils, and development of new technologies and use of existing ones for the remediation of soils and aquatic ecosystems from inorganic pollutants. HERSLab has strategically participated in the development of proposals that focus in developing the underlying science and the management tools for successful integrated water resources management. The laboratory has specialized in the use and demonstration of environmental Friendly technologies for the minimization of pollution in surface and groundwater. HersLab manages the Koiliaris CZO. The Koiliaris River watershed is a Critical Zone Observatory (www.koiliaris-czo.tuc.gr/) that represents severely degraded soils due to heavy agricultural impact such as grazing, over many centuries.

The HersLab team is a center of excellence that provides both research and training to undergraduate and graduate students in environmental engineering and science. The team is part of a small but vibrant University that in addition to other things claims excellence in research and training of its students. The HersLab team currently consists of two chemists-laboratory technicians and 5 PhD students at various stages of degree requirement completion. All personnel have extensive experience in field, laboratory and modeling studies.

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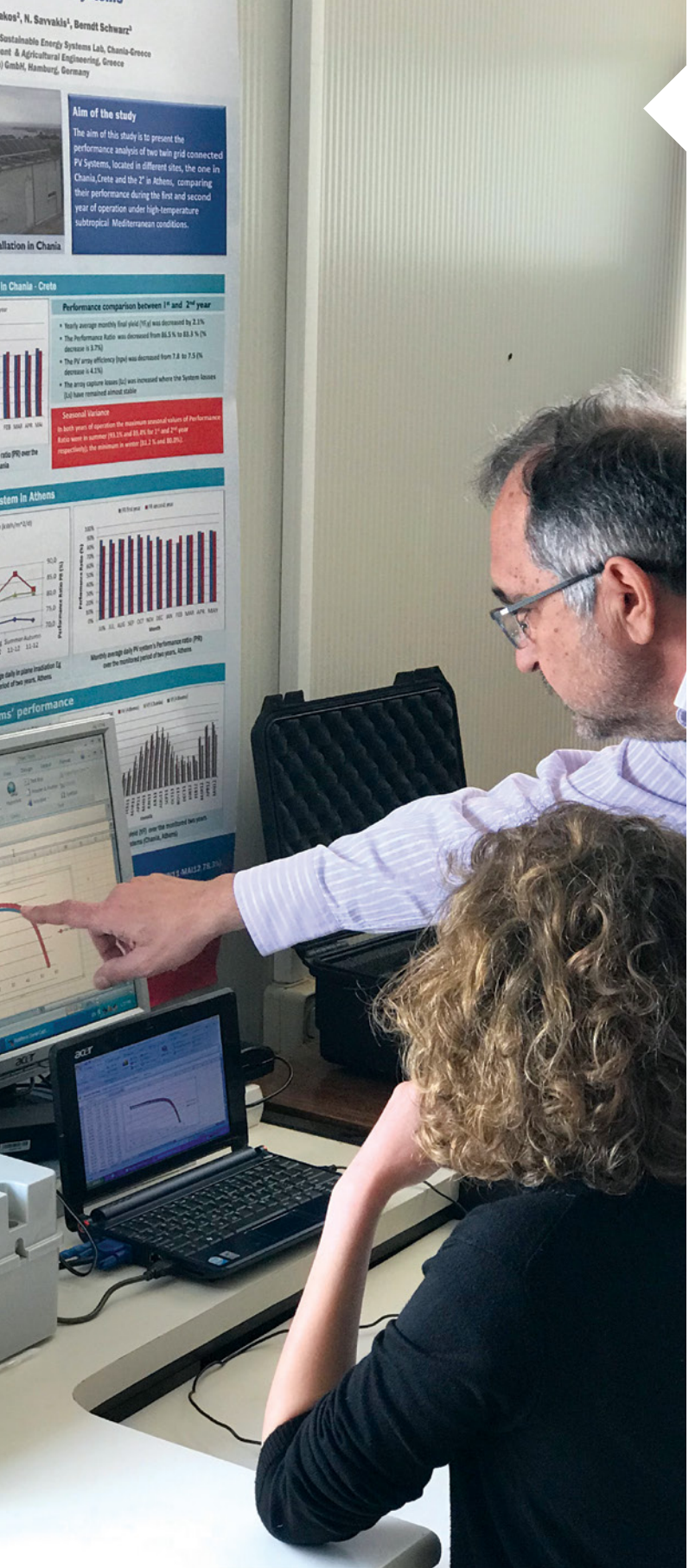

Renewable and Sustainable Energy Laboratory (ReSEL)

Site: www.resel.tuc.gr

Short Description: The Renewable and Sustainable Energy Systems Laboratory (ReSEL) of the School of Environmental Engineering, covers a wide range of knowledge subjects in the fields of Applied Research and Technology Development for Energy Planning and Sustainable Energy Management. More specifically, ReSEL expertise focuses on:

1. Sustainable Energy Systems-Policy and Planning;
2. Management of Renewable Energy and Energy Saving Systems;
3. Sustainable Building, Energy Management and RES Integration.

The ReSEL's multidisciplinary team of specialised researchers possesses extensive experience and knowledge in the Renewable and Sustainable Energy field. Our team has developed expertise and accumulated a highly competent know-how in managing EU-funded projects (H2020, IEE, Interreg, COST, MED, LEONARDO, FP7, FP6, SAVE, THERMIE, etc.), structural funds (3rd CSF, NSRF 2007-2013) and other national contracts. Our members have participated in more than 40 projects as coordinators and more than 60 as participating experts, mainly regarding:

1. Sustainable energy planning at regional/local level;
2. Knowledge and best practices transfer to policy makers as well as to industry and market actors;
3. Professional training and certification of technical professions;
4. Techno-economic analysis of sustainable energy applications;
5. Assessment and minimization of environmental impact of large scale RES projects;
6. Commercialization of new energy technologies;
7. Planning and implementation of dissemination activities on energy and environment.

The ReSEL's main objectives are to turn research and scientific knowledge to mature energy solutions and practices that are economically and technically sound, and to support the state to achieve the 2020 targets. Its staff is very efficient in creating synergies and in actively engaging the appropriate market actors through established relationships and cooperation channels, i.e. the Greek energy/RES/EE sector, local/regional authorities, governmental organizations, chambers, professional associations, NGO's, media representatives and journalists.

ReSEL has participated as project coordinator/partner in more than 40 EU contracted EU projects and grants.

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School of Architecture

Applied Mechanics Lab (AMELab)

Site: users.isc.tuc.gr/~kprovidakis/Research_Lab.htm

Short Description: The Applied MEchanics Laboratory (AMEL) is one of the Research Laboratories of the School of Architecture and is primary involved in the structural health monitoring, mechanical characterization of engineering structures, non-destructive evaluation techniques and materials technology. The secondary research objective of the AMEL aims at contributing to the realistic description of the structural behavior under various loading conditions (static or dynamic) by employing analysis and examination of all types of structural failures and assessment of the strength of damaged structures. In this laboratory, we, recently, specialize also in the design of smart structures, with particular concentration on the development of innovative actuators incorporating smart materials such as piezoelectrics, electrostrictives, and shape memory alloys. Structural health monitoring (SHM) techniques with the use of advanced sensing equipment is one of the recent focus of objectives of the AMEL. Other objectives of the AMEL Lab could be considered the investigation of repair and strengthening techniques, the earthquake engineering analysis of RC buildings, steel and masonry structures, the analysis of the behavior of repaired and strengthened RC or masonry structures under simulated earthquake loading, the nonlinear and experimental simulation of tunnel structures and buried pipelines networks by taking into account soil-structure interaction and finally the investigation and analysis of the contribution of different base isolation systems in buildings for eliminated seismic vibrations.

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Digital Media Lab

Site: dmlab.tuc.gr

Short Description: The Digital Media Lab covers the school's educational and research needs in the fields involving the convergence of media and technology, as they relate to architectural design. The Lab offers its services and technology to be used by all faculty, staff and students of the School of Architecture, TUC. Research projects open the Lab to the public and aim at bringing fresh ideas to reality. Research areas include-but are not limited to: computation in design, 3D modeling, parametric design, Building Information Modeling (BIM), Object Oriented CAD, databases in design, conceptual modeling, CAD/CAM, digital media for cultural heritage, visualization of music, new digital media. The Lab's equipment includes 1 Inspire 1 Pro drone, 1 Oculus Rift, 1 HTC Vive, 45 desktops, 2 large format (A0) plotters, 2 A3 printers, 4 A4 printers, 1 grayscale large format (A0) scanner/plotter, 7 laptops, 8 projectors and cameras. It also offers sophisticated software for CAD, Image processing, Video processing, 3D modeling, Sustainable building design, Web design + interaction and Augmented Reality. The Digital Media Lab covers the educational needs of 3 undergraduate mandatory classes, 2 graduate (master's) classes and supports the research of 5 PhD candidates in the School of Architecture.

Two of the lab's recent specialization areas are: Smart Buildings and New Technologies for Cultural Heritage. The lab participates in various European and National research programs and is a member of the INNOVA Virtual Archaeology International Network.

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Transformable Intelligent Environments Laboratory (TIE Lab)

Site: www.tielabtuc.com

Short Description: The Transformable Intelligent Environments Laboratory (TUC TIE Lab) at the School of Architecture in the Technical University of Crete was founded in 2012 on the basis of researching, developing and applying human-centered methodologies that target the qualitative upgrade and efficiency of a variety of environments, including learning spaces and playscapes, health environments, habitable extreme environments, cultural spaces and projection mapping installations, sustainable approaches with natural building systems as well as smart materials and spatial augmented reality systems. It employs interdisciplinary research approaches and participatory design techniques to explore flexibility, adaptability and transformability in space through analogue, digital or hybrid mediums. Buildings, spaces, equipment and materials are treated as platforms with a dynamic spatial imprint upon which the TUC TIE Lab researchers explore the optimal intervention in order to respond to human activity, requirement and wish. Moreover, the lab has developed a specific methodology for the successful implementation of IT in space titled sensponsive architecture, introducing the next step in responsive environments that exhibit 'sense' in their 'response'.

The laboratory is fully equipped with all the necessary technology to perform its research, including projection systems, robotic hardware, drones, VR sets, gestural interface devices, EEG portable devices, and has the ability to design, simulate and fabricate functional prototypes and real-life applications of nearly everything with CNC machines, laser cutters and 3d-printers. Its projects are also being supplemented by the other TUC labs.

The lab has made its international mark in the academic and research community through many interdisciplinary conferences and publications, as well as through national and international exhibitions. Moreover, for three years in a row, TUC TIE Lab projects have been distinguished with high-level ranking at the University Student Entrepreneurship-UNISTEP PLUS Projects. Additionally, in terms of awards, the lab received the Silver Award at the International Design Awards in 2014 for its “Many Happy Re-turns” project for children, and the Bronze Award at the Greek national Healthcare Business Awards in 2016 for the design of a multisensory healing room at the General Hospital of Chania.

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Materials for Cultural Heritage & Modern Building: MaCHMoB

Site: machmob.tuc.gr

Short Description: The activity of the Laboratory is focused on the study for the characterization, diagnostic, preservation, monitoring and management of the cultural and architectural heritage and modern buildings. The main research activities are in the following areas: Study of Built Heritage, more specifically the Weathering and Mechanisms of Stone Decay, Technology of historic mortars, Pigments and Ceramics, Development of eco-friendly and energy efficient Plasters for Building Envelope, Development and Characterization of novel Nanocomposites and Conservation Methodologies based on environmental friendly technological solutions, for the cleaning, consolidation and surface protection, Consultancy activity to public authorities and private institutions in conservations/restoration plans.

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