TECHNICAL UNIVERSITY OF LIBEREC
Faculty of Textile Engineering

www.ft.tul.cz

Faculty of Textile Engineering Technical University of Liberec

Faculty of textile was founded in 1960. It is the only university in Czech Republic to provide comprehensive education in textile domain. The faculty is very active in research and development and has numerous cutting-edge inventions including in the area of Nanotechnology. With its reputation as a prestigious institution, the faculty has extensive alliances with industrial partners. The faculty conducts varied projects sponsored by the industry. The vision of the faulty is to cooperate with global universities and institutions focused on textile and material engineering.

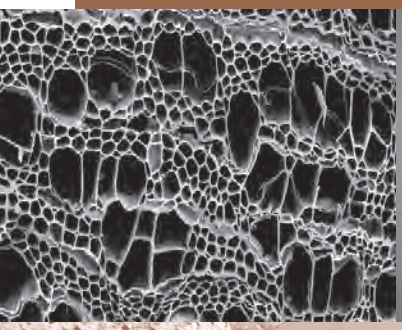
Main activities of the faculty

- *Academic activity*
- *R&D&I activities*
- *Transfer of technologies and knowledge*
- *Artistic and creative activities*

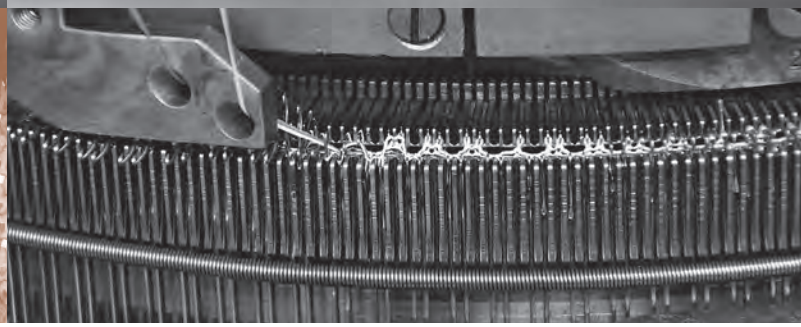
Structure of the faculty

- *Department of Textile Technology*
- *Department of Nonwovens and Nanofibrous Materials*
- *Department of Clothing Technology*
- *Department of Material Engineering*
- *Department of Textile Evaluation*
- *Department of Design*

Faculty of Textile Engineering
Technical University of Liberec







Are you looking for partners for cooperation in research projects?
Do you need to make a special analysis, measurements or expert opinions?
Do you need expert consultation?
Do you need to ensure training of textile issues?
If you answer to any of these questions YES, ***we are here for you!***

The material includes profiles of these laboratories

- *Laboratory of Hand Evaluation*
- *Laboratory of Comfort and Physiology*
- *Laboratory of Special Microscopy and Image Analysis*
- *Laboratory of Color and Appearance Measurements*
- *Laboratory of Composites and Nanocomposites*
- *Laboratory of Quality Assessment*
- *Laboratory of Tissue Engineering*
- *Laboratory of Thermal, Thermomechanical and Electrical Properties*
- *Pilot plants and studios*

CONTACT: Head of Dean's Office, Phone: +420 485 353 258, Email: daniela.brzezinova@tul.cz, laboratore.ft@tul.cz

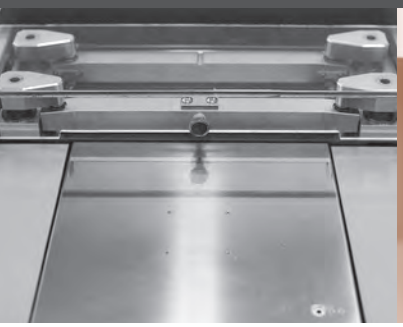
Laboratory of Hand Evaluation

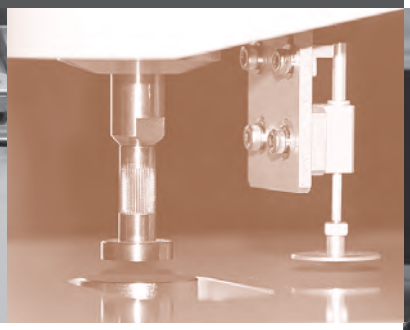
The main objectives and activities

- Systematic extension of basic database standards for all types of textiles designed for protective clothing, bed linens and technical applications,
- Development and application of new and non-standard (unconventional) measuring methods for achievement of optimal tools for evaluation of fabric hand and technical textiles.

Specialization of laboratory

- Evaluation of fabric hand by KES - FB system (Kawabata Evaluation System for Fabrics),
- Development and verification of specific methods for determination of fabric hand with alternative approaches,
- Development and verification of methods for determination of fabric hand.





Specific devices and outcomes

Touch represents basic qualitative characteristics of clothing textiles such as creasing, softness, fullness, THV (Total hand value) etc., Formulations of fabric hand are guaranteed by International bodies for standardization of hand evaluation (The Hand Evaluation and Standardization Committee, The Textile Machinery Society of Japan).

Laboratory of KES - FB (Kawabata Evaluation System for Fabrics) is a unique system of devices for testing six basic mechanical properties of textiles like tensile, shear, bending, compressibility, coefficient of friction and surface roughness. On the basis of these properties, it is possible to determine THV (Total Hand Value) and to make an objective evaluation of fabric hand.

In the laboratory, it is possible to make a subjective evaluation of fabric hand and compare it with objective evaluation according to conventions and standards.

TECHNICAL UNIVERSITY OF LIBEREC | Faculty of Textile Engineering
Studentská 1402/2 | 461 17 Liberec 1

Laboratory of comfort, physiology and sleep

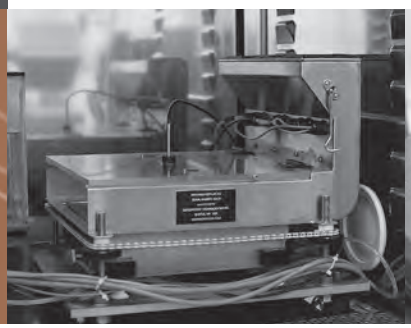
The main objectives and activities

- Development, production and testing of textile structures with adaptive heat absorption, specific optical effects and protection against electromagnetic smog,
- Development of smart textiles with enhanced comfort for workplaces with excessive exposure to pollutants (e.g. heavy security forces or chemical production / industry),
- Applied research in the field of technical clothing to enhance the comfort of automobile seats,
- Address problems of thermoregulation, transmission of heat and moisture, uptake and expenditure of energy in the system of organism-clothing-environment,
- Technical environment to design new types of clothing constructions and 3D products,
- Application of textile sensors into bed and clothing for detection of vital signals, bedsores (decubitus), kinesic behavior, incontinence, sweating, hypothermia etc.,
- Development, production and testing of special sensors in textiles for indication of location, movement and condition of carrier, evaluation of sleep quality or monitoring of vital functions.

Specialization of the laboratory

- Analysis of thermal insulation properties, air, water and water vapour / steam permeability in textile and composite materials,
- Evaluation of transport processes in conditions of practical clothing with monitoring of temperature, moisture and physiological manifestation of the wearer,
- Evaluation of all aspects of physiological hygienic properties of clothing and clothing materials for recognition of textile comfort,
- Complex analysis of signals for monitoring health and identification of problems with sleep like frequent movement, apnoea and unrest, which is a special solution for small children and elderly people.






Specific devices and outcomes

- Evaluation of air permeability in textiles and other porous materials according to standards ČSN EN ISO 923, ČSN EN ISO 7231, ASTM D 737, DIN 53 887 with devices like SDL M 021 S, FX 3300 from TEXTEST Instruments,
- Determination of heat resistance and heat conductivity according to ISO 5086-1 with Togmeter SDL M 259,
- Evaluation of thermal properties with ALAMBETA,
- Measurement of relative water vapor permeability (RWVP) and evaporation resistance (Ret) with Permetest
- Evaluation of resistance against water vapor and heat according to ISO 11092, ČSN EN 31092 (80 0819), ASTM F1 868 with PMS-2 from GF Instruments and Sweating Guarded Hotplate
- Monitoring, measurement and recording of liquid propagation through textile with MMT 290,
- Determination of hydrostatic resistance against water permeation under pressure - Determination of water column according to ČNS EN 20811 (80 0818), ISO 811, BS 2823, BS 3321, BS 3424, DIN 53889, AATCC 127 with SDL M018,
- Evaluation of resistance of fabrics against water absorption during water spraying with artificial rain, determination of impregnating effect of water-repelling materials, determination of waterproof materials and visual comparison of samples, determination of the amount of water absorbed and transmitted through the sample during the test according to ČSN EN 29865 (ČSN 80 0856) with Bundesmann BP 2,
- Analysis of physical processes and phenomena using high-speed color digital cameras and Speed 3 Olympus (150000 obr s-1) with special optics and premium SW,
- Non-contact measurement of temperature distribution of the surface of the human body and clothing,
- Detection of thermal leakage from buildings at different degrees of physical endurance and climatic conditions,
- Monitoring and visualization of degree of load and pressure with the X-Sensor blanket.

TECHNICAL UNIVERSITY OF LIBEREC | Faculty of Textile Engineering
Studentská 1402/2 | 461 17 Liberec 1

Laboratory of special microscopy and image analysis

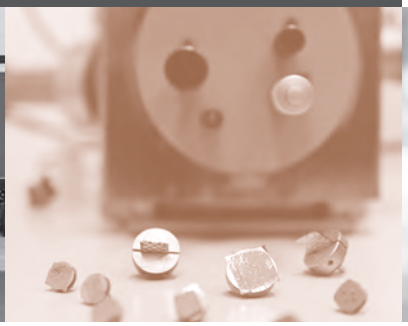
The main objectives and activities

- Analysis and modeling of internal and external structures of length, area and 3D fibrous materials,
- Determination of procedures for evaluation of textile structures from the perspectives of their internal and external geometry,
- Reconstruction and digitization of textile and composite structures using computer aided design,
- Processing of image information during evaluation of morphology and defects of textile materials and composites.
- Analysis of soaking (permeation of liquids into porous materials, monitoring of water film stability etc.).

Specialization of the laboratory

- Basic and advanced light, fluorescent, confocal, scanning and X-ray microscopy,
- Non-destructive surface analysis,
- Basic and advanced image analysis (Nis Elements, MatLab, Comsol-Multiphysics).

Laboratories are equipped with classical and professional microscopes including set of analogous and digital cameras, monochromatic and polychromatic. Analyses are possible with the reflected or transmitted light using special illuminating techniques (transversal lighting, illuminating circles etc.) or using special polarization filters. For non-destructive surface analysis, we have reversed 3D reconstruction (system like Talysurf and system RCM).



Specific devices and outcomes

- ***Optical microscopy*** – basic and fully professional macroscopes and microscopes with the possibility of taking pictures from 0,5x up to 1000x of magnification, possibility of taking „big pictures" with high resolution (taking pictures and assembling of particular pictures in x and y axis), possibility of taking 3D pictures (taking pictures and assembling of particular pictures in z axis for 3D visualization) for generating digital pictures, sequences of digital pictures, 3D visualizations, videos.

- ***Fluorescent microscopy*** – for macro and as well as micro objects in transmitted and reflected light (Nicon Eclipse Ti X cite 120q - 10x up to 60x magnification, special fluorescent filters, Olympus BX51 -1x up to 500x magnification, special integrated filters ND6, ND25, LBD, OP, exchangeable filters for observation of fluorescence: U-25ND6 and U-25ND25; filters for observation of objects in reflected light U-AN360-3 and U-PO3).

- ***Compact micro CT system SkyScan 1174*** – enables obtaining 2D sections by x-ray beams in observed 3D objects with subsequent reconstitution of 3D picture with specialized software package. It is possible to analyze these pictures from the perspective of length measurement, size of the object, shape of the object, orientation and porosity.

- ***Talysurf CLI 500*** – 3D measuring system of surface structure with a possibility of abrasiveness control in 2D. It is equipped with laser triangular probe with CLA confocal scanner that enables measurement with both contact and non-contact methods.

- ***RCM systém*** – Laboratory system for analyzing the surface of fabrics with the possibility of evaluating the roughness of fabrics, uniformity of structure - corduroy and pile fabrics, surface hairiness, piling.

- ***Image analysis NIS-Elements 3.22*** serves for interactive object and texture measurement of geometric parameters and characteristics of chromatic picture of textile and non-textile structures.

- ***Special methods*** – degree of bast fibres cottonization, geometric parameters of fibres, diameter and hairiness of yarn, lateral proportions of double twin yarn, yarn filling, twines of rotor yarn, determination of fibre coverage of spun yarn, fiber direction in yarn, areal coverage of fabric, geometry of threads linkage in the fabric from transversal slices, complex evaluation of areal structure of textiles, geometric parameters of rotor yarn, determination of lateral compressibility of yarns, bending rigidity of yarn, objective determination of degree of fabric pilling, evaluation of abrasion resistance of yarns, research of macroscopic structure of nonwoven textiles and fibrous system and concentration of contacts in nonwoven textiles.

TECHNICAL UNIVERSITY OF LIBEREC | Faculty of Textile Engineering
Studentská 1402/2 | 461 17 Liberec 1

Laboratory of color scheme and outward measurement

The main objectives and activities

- Use of advanced colorimetry for complex evaluation of product quality from different industry branches (textile, plastic, varnishes, cars, ceramics, paper, illumination, etc.),
- Development of new measuring systems and construction of optical devices prototypes,
- Development and application of SMART textile sensors on the basis of colour-changing pigments and dyes,
- Development of methods for physical activation of textile surface that enables reduction of the amount of dyes and chemicals necessary for production of final textile product,
- Research and development of techniques used for deposition of special textile modifications on the basis of nanotechnologies.

Specialization of the laboratory

- UV-VIS-NIR spectroscopy,
- Spectrophotometry and microspectrophotometry,
- Measurement of light sources,
- Measurement of material discolouration (photo, thermo and chemochromatic textile indicators),
- Special optical microscopy (LSCM, Polarimetric Imaging),
- Physical surface activation,
- Colorimetry and construction of special optical devices

LCAM was etablished in the 1999 as integral part of the department of textile materials in the Faculty of textile, Technical University of Liberec. It s a unique department not only within Czech Republic, but also in European Union. Evidence of this fact is that LCAM students from various countries like USA, UK or Australia finish special measurements for their PhD thesis. Currently, this laboratory consists of three departments namely; Laboratory of physical expositions, colorimetry and advanced colorimetry.

Specific devices and outcomes

- Spectrophotometers with diffusion and angular measuring geometry (D/0, D/8, 45/0) for measurement of colorimetric and spectrophotometric parameters (Datacolor, Minolta, HunterLab),
- Zehnter device for measurement of gloss at 60°, 20° and 85°,
- Chambers for visual evaluation D65, A, TL84, CWF, Horizon (X-Rite, Datcolor),
- Wide-range spectrophotometer SHIMADZU PC typically used for measurement of camouflage materials,
- Microspectrophotometer NiconAvantes-LIM for measurement of spectral parameters of microscopic samples,
- Special measuring system LCAM PHOTOCHROM for measurement of material discolouration,
- Spectrometers and radiometers (Avantes, Minolta, Goldilux) for measurement of light sources and picture calibration,
- Colorimeters for picture calibration and radiometric measurements (Minolta, Datacolor, X-Rite),
- Spectrofluorimeter Jobin Yvon FL 3-11 for fluorescence measurement,
- Exposure chambers with different light sources for activation of polymer surface,
- Calibration standards and color atlas (Munsell, NCS, PANTONE, CIBA, CERAM) for tone identification and for verification of measuring systems accuracy.

TECHNICAL UNIVERSITY OF LIBEREC | Faculty of Textile Engineering
Studentská 1402/2 | 461 17 Liberec 1

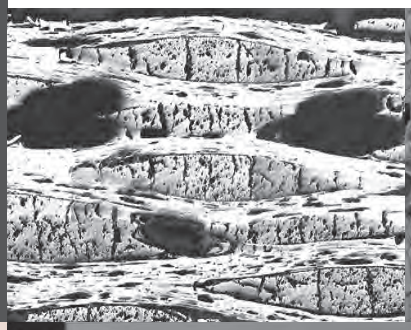
Laboratory of Composites & Nanocomposites

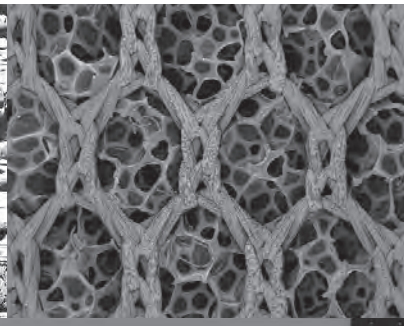
The main objectives and activities

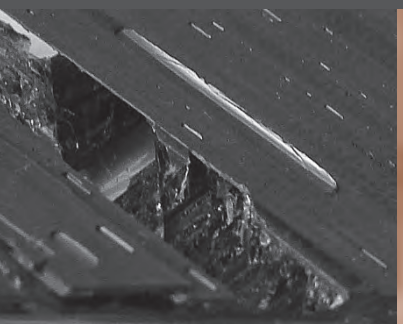
- Development of composite structures with basalt and carbon fibers,
- Development of nanoparticulate and nanocomposite systems with the aim of acquiring multifunctional effects (antistatic, antimicrobial, increased heat resistance, improved mechanical properties, self-cleaning effects, etc.),
- Standard methods of testing of mechanical and thermomechanical properties of composites,
- Development and application of new and non-standard measurement methods for reviews of hierarchical structures,
- Modeling the geometry and properties of textile structures, simulation of behavior of composite, comprehensive review of hierarchical structures, quality of textiles and special criteria for the design of textile structures.

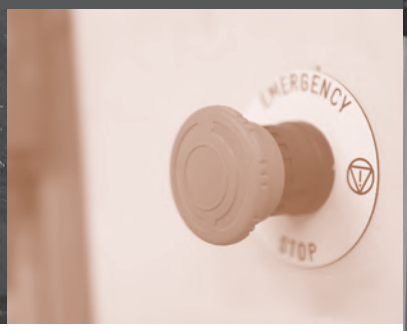
Specialization of the laboratory

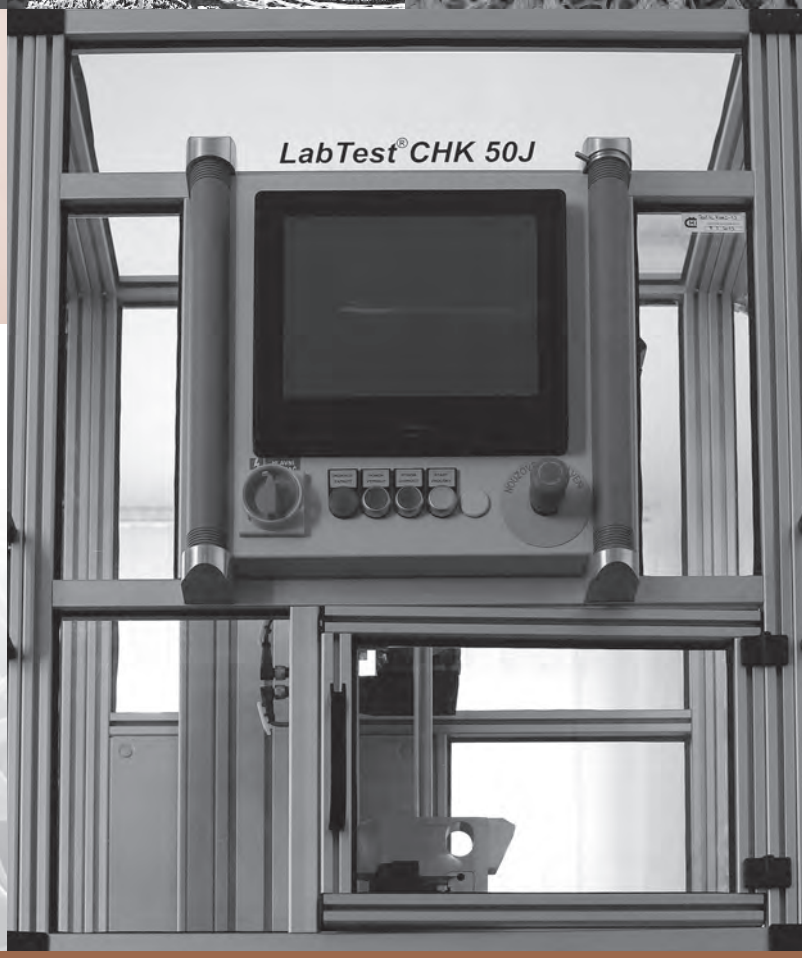
- Preparation of Nanoparticles (mechanically by grinding or chemically),
- Creation of composite structures with different geometry of reinforcement,
- Testing 3-point bending statically and dynamically,
- Analysis of impact toughness, fortress and ductility of the composites.











Specific devices and outcomes

- ***Nano noughts and crosses***
- ***High-temperature furnace***
- ***Charpy impact tester***
- ***High pressure compression device***
- ***Diamond circular saw***
- ***Vacuum equipment for the production of composites***
- ***Devices for preparation of thin sections***

TECHNICAL UNIVERSITY OF LIBEREC | Faculty of Textile Engineering
Studentská 1402/2 | 461 17 Liberec 1

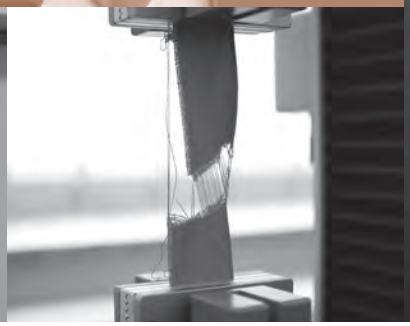
Laboratory of Quality Evaluation

The main objectives and activities

- Production, development and modeling of fibrous structures for special areas of usage,
- Testing structure and quality of linear textiles, surface, 3D textiles and special fibrous structures.

Specialization of the laboratory

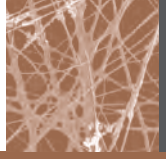
- Analysis of internal and external structures of linear and planar fibrous formations and testing their mechanical properties including safety.



Specific devices and outcomes

- Analysis of mass irregularity and defect in strand of roving and staple fiber yarns by capacitive method (Uster Tester 4-SX),
- Evaluation of hairiness of staple fiber yarns (G Zweigle 567),
- Evaluation and characterization of silk clothing (TST2 Lenzing),
- Evaluation of resistance of textile materials (woven, knitted and nonwoven textiles), burst ball and cut (Testometric M350-10CT),
- Measurement of resistance of textile materials (Woven, Knits and nonwoven) in the airflow (EC 37),
- Measurement of speed of sound passing through textile material and determination of acoustic properties as dynamic modulus of fiber and planar textiles (DMT PPM5R Lawson Hemphill),
- Measurement of dynamic mechanical properties of silk yarns (stretching yarn, friction yarn on yarn, yarn on pin, volume unevenness, number of defects, diameter and hairiness of yarn (CTT Lawson Hemphill),
- Evaluation of surface resistance of textiles due to abrasion and fabric pilling according to DIN EN ISO 12947-1, 2, 3, 4 on the unit Martindale M235,
- Analysis of pilling effect of fabric on M227 ICI Pilling & Snagging Tester, Taber Wear and Rotary Abrasion Tester,
- Analysis of trace concentrations of heavy elements using the polymer matrix method (LIBS),
- Testing of dusting textiles - Characterization and Analysis of dust emitted from textiles,
- Measuring bending rigidity of yarns, fabrics and knitwears (TH-7),
- Analysis of pH measurement, determination of color fastness, washing process management, residues and conductivity analysis (MORAPEX),
- Analysis of aging through simulation of weather conditions (M029 VCON).

TECHNICAL UNIVERSITY OF LIBEREC | Faculty of Textile Engineering
Studentská 1402/2 | 461 17 Liberec 1



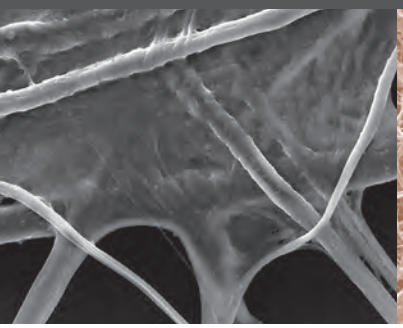
Laboratory of Tissue Engineering

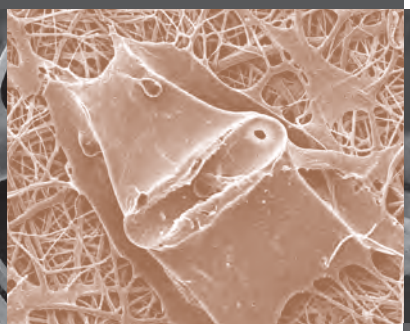
The main objectives and activities

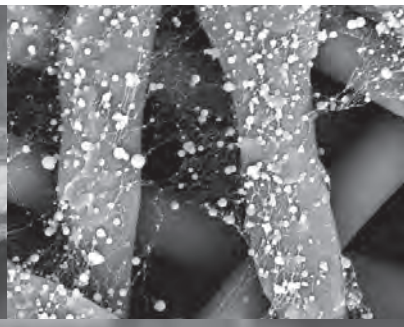
- Development of nano / micro fiber and fiber composite materials suitable for use in tissue engineering (refund cartilage, bone, blood vessels, nerve and skin tissues),
- Testing cytotoxicity of materials,
- Static and dynamic biological in-vitro testing of surface and 3D structures,
- The development and testing of system transport of medicines (drug delivery),
- Research and development of new fiber spinning principles leading to production technologies for nanofibres and nanofibrous composite materials ,
- Development and production of textile composite materials for healthcare (wound covers, bandages).

Specialization of the laboratory

- Research and development of biodegradable tissue engineering (Intelligent wound covers, artificial vascular grafts, replacement of bone and cartilage),
- Focus on nanofibers, composite materials, foams, 3D structures and linear units,
- Morphological analysis of manufactured materials using optical (including fluorescence), electron microscopy and EDS analysis,
- Testing of materials in-vitro using selected cell cultures (3T3, NHDF, HUVEC, MG63, Hecate) for cytotoxicity, cell adhesion promoter, viability and degree proliferation of cells (MTT assay Fluorescence microscopy and SEM) and cartilage.







Specific devices and outcomes

Collaborations

- ***Institute of Experimental Medicine***
- ***ASCR***
- ***2nd Faculty of Medicine***
- ***PF UPOL***
- ***Regional Hospital Liberec***

TECHNICAL UNIVERSITY OF LIBEREC | Faculty of Textile Engineering
Studentská 1402/2 | 461 17 Liberec 1

Laboratory of Thermal, Thermomechanical and Electrical Properties

Thermo

The main objectives and activities

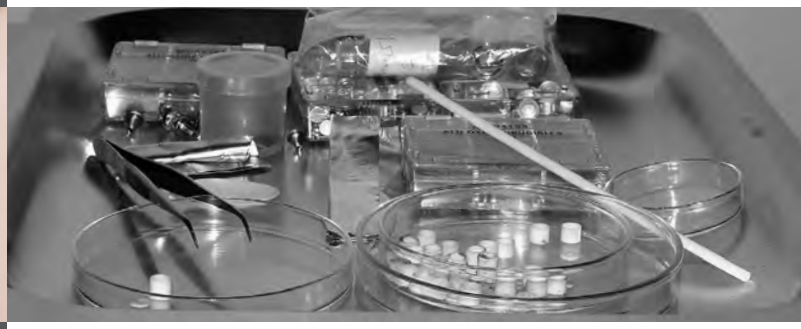
- Study of structural parameters of textiles and materials using thermal analysis methods,
- Identification of the material,
- Tracking of mechanical, structural and reaction properties of materials in relation to the thermal load.

Specific devices and outcomes

- Differential Scanning Calorimetry (DSC)
- Thermomechanical Analysis (TMA)
- Dynamic-Mechanical Analysis (DMA)
- Thermogravimetry (TGA)

Specialization of the laboratory

- Measurement of transition temperature (Melting, Glass transition, Crystallization),
- Determining the degree of crystallinity and thermal coloration,
- Evaluation of enthalpy of thaw, enthalpy networking and curing, reaction kinetics and efficiency of antioxidants,
- Analysis of copolymers and blends of polymers,
- Thermal and oxidative stability,
- Effectiveness of fire retardants,
- Volatilization of low molecular weight, polycondensation product, solvents, determination of fillers,
- Coefficient of thermal expansion,
- Thermo-mechanical properties, tensile modulus and shear, real and imaginary component module, loss angle.



Electro

The main objectives and activities

- Modification of conducting fibers for new uses,
- Development of textile sensors and sensors suitable for use in textiles,
- Modeling of electrical properties of textile fibers using computer assisted designing,
- Development of evaluation methods of anisotropy electrical properties of materials.

Equipments

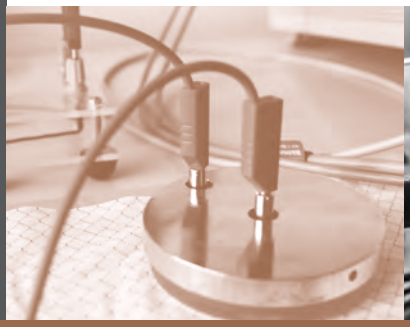
- Circumferential analyzers (Rohde & Schwarz) - preparation of samples for measurement of electromagnetic shielding (textile, sandwich structures, composite materials, etc.),
- Impedance / material analyzer – Agilent E4991A + Dielectric material test fixture – Agilent 16453A (measurement of dielectric permittivity in a range 1 MHz - 1 GHz),
- Universal frequency counter – Agilent 53131A,
- Resistance meter – HP 4339B + extenders on measuring volume resistivity, surface resistivity, of surface directional resistivity,
- Stat – charge FD-28 (for measurement of electrostatic hubs),
- Polystat (for measurement of potential of the sample),
- LCR meter–measurement of resistance, capacitance and inductance,
- TEPAO MMETP E6-13A (for resistance measurement),
- Handheld meter for measurement of microwave radiation leakage.

Specialization of the laboratory

- Measurement and analysis of electrical properties of textile structures,
- Development of special materials with the use of conducting fibers.

Evaluation of material parameters

- Surface resistivity of materials [Ω] and bulk resistivity of materials [Ω.m],
- Anisotropy of surface and volume resistivity of materials,
- Capacity of materials (including dependence on deformation of test material),
- Measuring the percolation threshold of conductive material with the proportion of conductive phase,
- Measuring the polarity and amount of charge generated by rubbing two materials and its size in the range of 3-30 kV.cm-1,
- Surface potential of insulators,
- Permittivity of materials and electromagnetic shielding of materials.



TECHNICAL UNIVERSITY OF LIBEREC | Faculty of Textile Engineering
Studentská 1402/2 | 461 17 Liberec 1

TECHNICAL UNIVERSITY OF LIBEREC
Faculty of Textile Engineering

www.ft.tul.cz

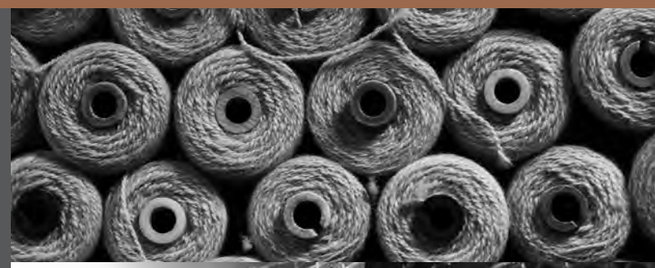
Production Labs & Facilities

Printing and other processing procedures

- Digital printing using a MIMAKI Textile Jet TX-1600S,
- Printing table with magnetic squeegee for printing with flat template (max. width: 53 cm),
- IR laser-guided surface treatment of textile substrates and-patterning,
- Device Foulard for depositing solutions and suspensions on porous materials and other fabric treatment,
- Plasma and microwave reactors for modifying textile surface,
- Spray drying device for the preparation of capsules,
- Measurement of the Rheological properties - optimizing the composition and quality of printing pastes using VT550 Viscometer,
- Ultrasonic Homogenizer for process intensification of textile chemistry, preparation of emulsions and suspensions,
- Dyeing apparatus AHIBA NUANCE ECO with infrared heating.

The main objectives and activities

- To develop special textile structures or their modifications to increase utility value of products using laboratory or equipment for the spinning, weaving and knitting,
- To produce nonwovens and nanotextiles,
- To produce multi-layered composites, 3D woven and knitted structural composites and nanoparticle reinforced composites,
- To perform printing, skimming (depositing), specific processing procedures (laser, encapsulation, microwaves) sewing and unconventional bonding,
- To use computer programs (TEX-Design, TEX-Dress, TechKnit, TexCheck & TexLine) from conception of design idea to manufacture of end product,
- To design clothes using professional software (CoralDraw & Adobe Photoshop),
- To process design of fabrics using CAD EAT systems,
- To process constructional solution design using CAD Inves Mark Futura, Design concept, MTM, ClasiCAD,
- To schedule industrial production with assistance of Optiplan CAM or Wittness system.



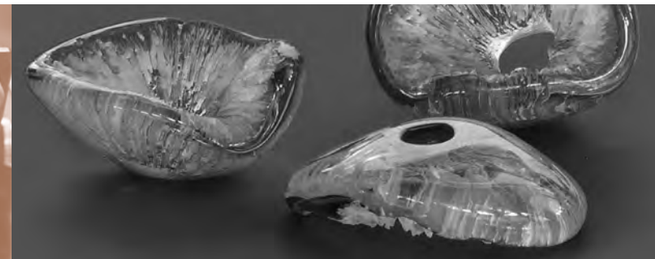
Glass and Jewellery

- Jewellery workshop for making bijou and jewellery products,
- Casting equipment - Mix Cast from Auren company,
- Electric kiln for slumping glass and dye fixation,
- Blasting equipment - sandblasting box for surface treatment of glass,
- Engraving and grinding machines for surface treatment of glass.

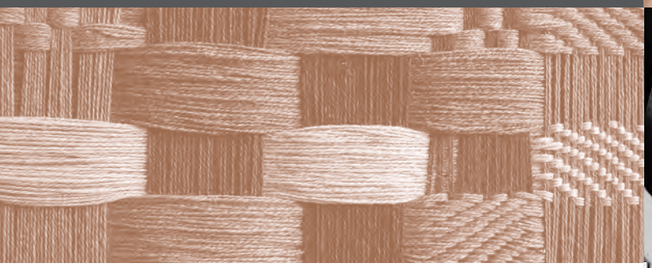
Field of specialization

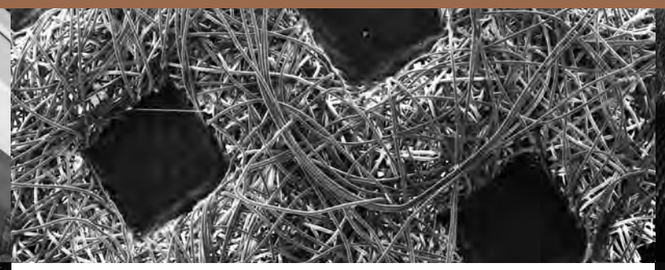
- Development of comprehensive solutions for Glass, Jewellery and Textile accessories - from draft design upto complex presentation of the final product,
- Modification of the jet and ring spinning,
- Development and testing of special textile structures to allow controlled moisture transport,
- Development, manufacture and testing of textile structures with special optical effects. Use of optical fibers in jacquard patterning and multipurpose fabrics,
- Development, manufacture and testing of complex thin-walled woven and knitted structure for synthetic vascular grafts,
- Modification of yarn for subsequent production of special fabrics and knits with the option to increase the utility value of the fabrics, or to reduce material and energy intensity of production,
- Use of optical fibers, shape memory materials, hollow fibers and profile fibers for innovative technical products,
- Development of constructional solutions for highly functional sports clothing with increased safety,
- Implementation of sensors into textiles and their interconnections by conductive pathways,
- Use of plasma and laser for treatment of textiles. Use of non-traditional ways of intensification of treatments (ultrasound, microwaves) and fixation of active substances on textiles (encapsulation, coating, layers),
- Use of nanotechnology - photocatalysis using TiO_2 nanoparticles; preparation of inorganic nanofibres through electrospinning of polymer solutions prepared by sol-gel method,
- Experimental research through analysis of newly developed textile structures containing nanoparticles and nanofibers from the point of view of mechanical, thermal, electrical, electro-magnetic, filtration, transport and biological properties,
- Development, manufacture and testing of new and modified textile structures mainly for hygiene, healthcare and industrial applications such as filtration,
- Processing of different types of staple fibers by mechanical means; strengthening of nonwoven textiles mechanically, thermally, chemically or by appropriate combination of technological processes,
- Production of nonwovens using meltblown and preparation of nanofiber layers by different procedures,
- Application and evaluation of final treatment - hydrophobic, oleophobic, antistatic, non-shrinking, wrinkle-resistant, soiling and non-flammable properties,
- Qualitative and quantitative analysis of fibers; determination of the content of individual components in a fiber mixture,
- Impact of individual components of the printing paste on the final print parameters and objective evaluation of their shades,
- Efficiency of the washing process, evaluation of detergents, evaluation of bleaching agents including stabilizers and efficiency of sequestering substances; optimization of dyeing processes and patterning.

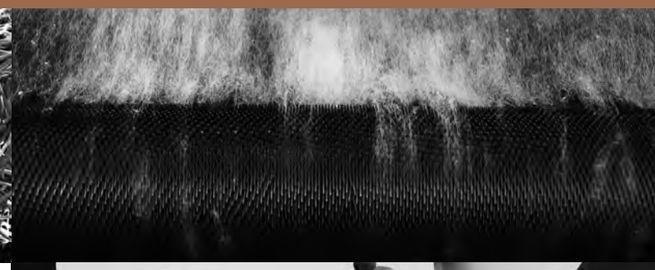
Spinning • Weaving • Stranding • Knitting • Production of nonwovens • Connecting conventional and unconventional • Printing and treatment procedures • Glass and Jewellery



TECHNICAL UNIVERSITY OF LIBEREC | Faculty of Textile Engineering
Studentská 1402/2 | 461 17 Liberec 1





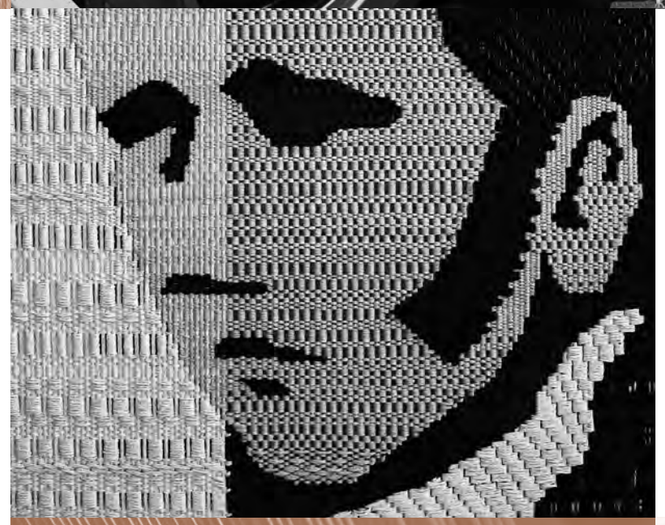


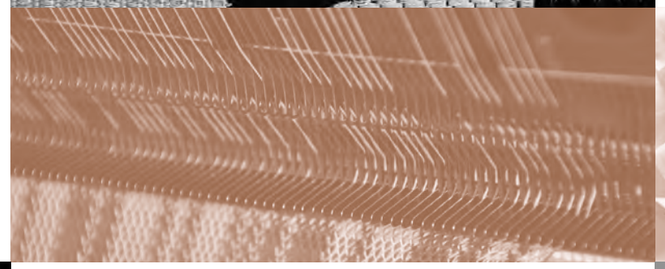
Spinning

- Mini line for the production of classical ring cotton yarn - laboratory carding, drawing frames and ring spinning machine,
- Rotor spinning machine for production of yarn from sliver,
- Single-spindle ring twisting machine - to enable production of maximum eightfold twisted yarn,
- Single Head winding machine with yarn cleaner - to rewind yarn from one bobbin on a cross-wound package with defined yarn length and with simultaneous removal of the predefined defects.

Weaving

- Hand weaving looms for interior textiles, art purposes and experimental formation,
- Loom with jacquard shedding equipment - used for weaving narrow fabrics for technical applications; it enables weaving with plain, tubular and bifurcated fabrics,
- Loom with jacquard shedding mechanism (including CAD system for the preparation of the pattern) for standard woven fabrics for clothing and technical applications,
- Laboratory weaving machine with tappet shedding mechanism for manufacture of fabrics (including leno) from standard and special materials (optical fibers, Nitinol, basalt, carbon fibers, hollow fibers, etc.) for clothing and technical applications.





Production of nonwovens

- Pilot production line for nonwoven textile layers and their mechanical, chemical and thermal strengthening (disintegrating machine and a 3-cylindrical carding machine, cross fitter, fitter perpendicular strut type STRUTO, stitching and bonding machines, heated press, heated calender, industrial and laboratory hot air chamber),
- Meltblown pilot line,
- Nanospider equipment for production of nanofiber layers,
- Experimental technology for the production of nanofiber and nonwoven textiles.

Stranding

- Stranding (Splicing) machine for producing strings with or without the core.

Knitting

- Warp knitting machine in division E20, with three laying machine for the production of knitted fabrics,
- Single Raschel machine in division E12, with six laying machine,
- Gallon knitting machine in the division E10,
- Flat weft knitting machines in various divisions (E4, E5, E7, E8, E10, E12), electronic jacquard - Brother (division E5), Pfaff (division E5) Singer (division E4, E6),
- One-cylinder small-diametric circular knitting machine for manufacturing single jersey knitted fabric (division E20 and E25 with a diameter of 5“),
- Twin-cylinder sock knitting machine (DHA 14) ,
- Central and large diameter double-bed circular knitting machine,
- Bobbin knitting machine,
- Electronically controlled jacquard flat knitting machines Shima Seiki.

Connecting conventional and unconventional

- Industrial single needle sewing machine for stitch bonding to the bottom jag feeder (SIERUBA L818F-M1, BROTHER DB2-B755-403A, JUKI DDL-888),
- Industrial single-needle sewing machine for stitch bonding with needle feeder (Brother Idustries DB2B721-3),
- Single-needle chain stitch sewing machine (Brother Industries DT4B261-012-0),
- Overlock sewing machines (SIERUBA model 747E),
- High-speed flat interlock sewing machine with a bottom and top cover stitch (SIRUBA W122-356),
- Two needle sewing machine with 2-threads lock stitch (Brother LT2 -B842-3,
- Semi-automatic sewing buttonholes Brother DH4-B980),
- Backing ironing technique - Nov Meyer RPS-MINI and electro-steam iron with steam,
- Continuous fusing machine for lining seam tape using hot air (PFAFF 8303-040),
- Ultrasonic welding machine (PFAFF 8310-142 / 001),
- Welding machine for hot wedge bonding (PFAFF 8340-020 / 01),
- Fixing machine PL / T Comela by hot air,
- Tajima model embroidery machine - C (15 colors, 1200 stitches per min. 600000 stitches memory).