

Internships FT summer 2016

Topic Comfort properties of car seats
 Specifications literature research, testing of comfort properties, measurement of comfort of car seats
 Period two months
 Contact, tutor doc. Antonín Havelka, Department of Clothing

Topic Clothing comfort and technology
 Specifications literature research, testing of properties, moisture transport through clothes while air flow, compressing clothing, seamless clothing production
 Period two months
 Contact, tutor doc. Antonín Havelka, Department of Clothing

Topic Thermal Behaviour of Fibrous Materials
 Specifications Physical and chemical properties of different textile structures, Evaluation of the sample materials for thermal conductivity and convection in order to identify the promising approaches, Particle image velocimetry (PIV) and TCi evaluation, Morphological and Thermal studies of the samples, Creation of programs for computer assisted prediction of thermal conductivity and transient diffusion, Optimization of the process parameters for the promising approaches, Scaled- up production of the material/s, Optimization of composition of multi-layered structures by programs for thermal conductivity and transient diffusion, Modelling of thermal insulation behaviour for various textile structures.
 Period two-three months
 Contact, tutor prof. Jiří Militký, doc. Rajesh Mishra, Department of Material Engineering

Topic Functional Composites and Nanocomposites with 3D Fibrous Architecture
 Specifications Design and development of 3D woven structures with different fibre materials using various fabric manufacturing technologies e.g. 2D & 3D weaving, braiding, triaxial weaving etc., Evaluation of high performance properties for 3D fabrics e.g. impact resistance, knife penetration resistance, irradiation resistance etc., Development of composites based on 3D woven aramid fabrics, Energy absorption mechanism of composites, Mechanical resistance characterization, stress-strain behaviour, initial modulus, ultimate strength and elongation, Complex characterization of mechanical resistance by ball bursting test, Cut resistance, Dynamic mechanical analysis (DMA), Thermogravimetric analysis (TGA), Modeling of 3-D Orthogonal Fabric reinforced composites and nanocomposites using Finite Element modelling.
 Period two-three months
 Contact, tutor doc. Rajesh Mishra, Department of Material Engineering

Topic Modeling, Simulation, Prediction and Measurements of Heat and Moisture Transport Properties of Fibrous Structures
 Specifications Modeling and simulations for complex fibrous structures in thermal property, mechanism of heat transfer in fibrous structures, temperature distribution in fibrous



structures, Comparison of the theoretical results with experimental results to find the correlation, Analysis of theoretical models and simulations, design and optimization of complex fibrous structures, textile structures composed from specialty fibres and fibres with special geometry (hollow, grooved etc.), The influence of fibrous phase and porosity on fibrous structure thermal conductivity.

Period two-three months

Contact, tutor prof. Jiří Militký, doc. Dana Křemenáková, Department of Material Engineering

Topic Application of Nanoidentation for Characterization of Fibres and Reinforced Nanocomposites

Specifications Nanoindentation as a tool to investigate the mechanical properties of materials at nanometer-scale displacement and smaller load range, functionally graded materials, nanocomposites, heterogeneous materials in various engineering areas, mechanical and biomedical engineering, a critical evaluation of the stress and deformation, prediction of reliability and failure behavior of polymer structures, mechanical properties of the surface of polymers, load-displacement behavior carried out by applying the increasing load and decreasing load, evaluation of the indentation hardness, applications with sharp and geometrically self-similar indenters, hardness and elastic modulus as a function of the imposed contact conditions, coefficients of strain-rate sensitivity of plastic performances, plastic deformation and mobility in a solid, loading rate sensitivity (LRS), application to fibres and composite properties in nano dimension

Period two-three months

Contact, tutor doc. Rajesh Mishra, Department of Material Engineering

Topic New types of Side Emitting Polymer Optical Fibrous Materials

Specifications Enhanced side emission effect of plastic optical fiber (POF) by thermal treatment, controlled degradation and surface modification to avoid total internal reflection. New methods for enhancement of side emission, Comparison of different methods to find the best way for side emission

Period two-three months

Contact, tutor doc. Dana Křemenáková, doc. Rajesh Mishra, Department of Material Engineering



Topic Application of PIV for Visualization of Heat Flows Through Fibrous Structures

Specifications The Particle Image Velocimetry (PIV) principle, measurement in the wide range of flow speeds, The basic condition for the successful measurements, property of the examined medium, continuity of the laser light and the possibility of current sensing camera, perpendicular optical approach to the measurement area, the transparency of the measured fluid and entrained particles, The basic building block of the measuring system, laser PIV system Dantec Dynamics, current distribution of velocities in two-dimensional array in a flowing fluid, The motion of the fluid, visualization of the seeding particles added to the flow, particles movement in selected planar light cut, laser and optical system components, media sensitive to light, such as photographic film or a CCD camera detector, fundamental equations expressing of the relationship between speed, distance and time, displacement of particles entrained fluid flowing in a defined time interval between two laser pulses, Application to complex fibrous structures.

Period two-three months

Contact, tutor doc. Rajesh Mishra, prof. Jiří Militký, Department of Material Engineering

Topic Comfort of Protective Fabrics at Extreme Temperature Conditions

Specifications Evaluation of textile structures used for thermal insulation clothing, Thermal conductivity, thermal resistance, thermal diffusivity, thermal absorptivity, thermal effusivity, density and thickness. heat transfer by conduction through the different thickness of fabrics used as thermal insulators especially at subzero temperatures, Evaluation of various techniques for measurement of thermal properties of fabrics, Alambeta, C-Therm Thermal conductivity analyzer (TCi), Thermal response and behavior for the selected fabrics, Relationship between the thermal conductivity, thermal resistance, thermal absorptivity, thermal diffusivity and thermal effusivity with fabric density and porosity, Particle image velocimetry for thermal convection.

Period two-three months

Contact, tutor doc. Rajesh Mishra, prof. Jiří Militký, Department of Material Engineering

Topic Preparation, Characterization and Application of Nano-particles (Conductive, Antimicrobial, Flame Resistant)

Specifications Nanosize particles can exhibit unexpected properties different from those of the bulk material. The basic premise is that properties can dramatically change when a substance's size is reduced to the nanometer range. The applications of nanoparticles e.g. carbon black or some finishing agents in textile industry has long tradition but are in fact not part of nanotechnology. Typical feature of nanotechnology in textile is to use nanoparticles with some systematic arrangements.

Period two-three months

Contact, tutor doc. Rajesh Mishra, prof. Jiří Militký, Department of Material Engineering

Topic Electrospinning of Nanofibrous Layers with Functional Properties

Specifications Textile wastes, pre-consumer or post-consumer textile waste, by-products from textile, fiber-or cotton industries, automotive, aeronautic, home building, furniture, mattress, coarse yarn, home furnishings, paper, apparel and other applications, Utilization of textile wastes to prepare carbonaceous compounds, Microwave assisted

pyrolysis filled with conducting polymers and iron catalyst, Cyclic oxidation (oxidative carbonization at 2400C in air followed by cyclic oxidation at 4000C, Hydrothermal carbonization process in hot compressed water under the presence of citric acid at 2000C or under the presence of metal ions, aliphatic dicarboxylic acid, adduct of bisphenol A, silicon based finishing, Functionalization of surface of carbonaceous compounds, Chemical oxidation by nitric acid and other oxidizing compounds, Low temperature atmospheric plasma with controlled oxidation, Ozonization, Nanoindentation to characterize mechanical properties, Preparation of activated carbon from carbonaceous compounds, Physical activation by exposing carbonaceous material with oxidizing gases such as steam or CO₂ in temperature range of 600-12000C, Chemical activation by impregnation of the textile waste with chemicals such as H₃PO₄, KOH, ZnCl₂, and NaOH followed by heating under inert atmosphere at temperatures in the range 450-9000C, Preparation of low cost functional carbon nanoparticles from carbonaceous compounds, Applications of carbonaceous compounds and low cost functional carbon nanoparticles, Odor-absorbency for cigarette smell, Antistatic property for dust proof clothing, Monitor human body from changing temperature, humidity, pressure in the surroundings.

Period two-three months

Contact, tutor doc. Rajesh Mishra, prof. Jiří Militký, Department of Material Engineering

 Topic Natural Fiber Based Bio-composites

Specifications The use of natural fibres for technical composite applications, economic advantage of natural fibres, potentials of natural fibre composites, The potential usage of natural fibre based 3D woven fabrics in the impact protection applications, 3D woven fabrics of various structures in comparison with 2D fabrics, 3D woven biocomposites embedded with nanoparticles, enhancement of the tensile properties of the matrix, nanofillers in the matrix, mechanical interlocking in the composite system, functional characteristics of the 2D & 3D woven nanocomposites from bio resources, Surface functionalization: Surface functionality of the bio materials, biomolecule adsorption on the surface by bottom-up nanofabrication approach, nanofabricated surface. Biobased Lysine Diisocyanate, Acetylation and torrefaction (thermal treatment under evacuation at 250°C), UV treatment, plasma treatment and ultrasound, most effective way for surface functionalization, Simulation and optimization of structure and properties, Modeling the structure with regard to its geometry for composite reinforcement, Prediction of mechanical properties, Simulation of impact and fatigue performance, simulated for biocomposites and nanocomposites reinforced with 3D woven structures, Validation of predicted results.

Period two-three months

Contact, tutor doc. Rajesh Mishra, Dr. Blanka Tomková, Department of Material Engineering

 Topic Multiple Criteria Evaluation of Quality and Comfort

Specifications Quality as the essence of business activity, global trends in perception of quality, definition of quality, complex quality characterization in textile material, parameters of quality evaluation, evaluation based on objective assessment, Quality for dress materials, psycho-physical parameters, statistical treatment of data so as to obtain a parametric weighted characterization of over all quality, Comfort quality aspects of clothing, Physiological comfort (Heat, moisture and air transmission), Physical comfort (Mechanical properties), Psychological comfort (Appearance, acceptability, fashion), Thermal Manikins in Clothing Study, The total appearance value (TAV) of a fabric,



fabric design and characteristics of raw material, artistic design and/or engineering design, engineering design concerned with constructional details, Material characteristics along with engineering design specification, aesthetic appearance parameters, drape (mechanical properties), texture (constructional parameters), wrinkle (irregular surface deformations) and pilling (surface abrasion), estimation of integrated degree of satisfaction (DS), bootstrap type simulation for statistical characterization of DS.

Period two-three months

Contact, tutor doc. Rajesh Mishra, prof. Jiří Militký, Department of Material Engineering

 Topic Development and Characterization of Single polymer Composites

Specifications Polymer composites formed by embedding and orienting fibers (polymer, glass, carbon, etc.) in a thermoplastic matrix polymer, recycling of composites depending on different compositions between fiber and matrix, fiber-matrix interface, chemical compatibility, development of single-polymer composites (SPCs), integrating high strength fibers into a matrix of the same polymer, characterization by improved adhesion quality between the matrix and the reinforcement, General physical and chemical background of phenomena accompanying fiber-matrix adhesion, properties of interface, synergy effect, matrix changes under curing process, and its link to SPCs structure and properties, The hot compaction process, Polypropylene (PP) SPCs at different temperature and pressure, Evaluation of thermomechanical properties of the PP SPCs, Investigation of the morphology of the fibers in the SPCs, advanced microscopy techniques from real images of composite samples, Nanoindentation as a special technique to evaluate mechanical properties at the fiber-matrix interface, Advanced mechanical testing, Dynamic Mechanical Analysis, Sound Velocity Propagation Test, Nanoindentation, Thermal characterization, DSC Analysis, TGA Measurements, FEM for simulation of properties

Period two-three months

Contact, tutor Dr. Blanka Tomková, doc. Rajesh Mishra, Department of Material Engineering

 Topic Electro Conductive and EMI Shielding Textile Structures

Specifications EMI smog, Shielding effectiveness measurement for textiles, source of electromagnetic radiation, standardized methods for measuring shielding effectiveness, comparison and evaluation of shielding of material, calculation based on correlation between electrical resistance and electromagnetic shielding, conductive fabrics with sufficient electromagnetic shielding efficiency, conserving the main properties, e.g. comfort properties, drape ability and process ability characteristics, Fabrics with diverse structure, different portion and different placement of hybrid yarn containing extremely fine metal fibers, Hybrid yarns forming weaves and knitted fabrics, volume resistivity (standardized method) and its electromagnetic shielding efficiency, Percolation threshold, dependence of total shielding effectiveness SE on the amount of conductive component P in hybrid yarn or opening size of conductive grid and dependence of total shielding effectiveness SE on volume resistivity, metal grids for higher SE , Dependence between volume resistivity and SE for samples, Specially designed fabrics with increased resistivity to electromagnetic smog having wearing thermo physiological comfort, Negative effect of addition of metal fiber on abrasion resistance of fabric.

Period two-three months



Contact, tutor prof. Jiří Militký, doc. Rajesh Mishra, Department of Material Engineering

Topic Application of Plasma, Microwave, Laser and Ozonization in Surface Activation

Specifications Atmospheric plasma technology, Industrial applications. functionalizing, and design of surface properties of textile fibres, Plasma technology to modify the chemical structure as well as the topography of the surface of the material, plasma treatment of textile materials, shrink-resist treatment, of wool with a simultaneously positive effect on the dyeing and printing, modification of the topography of the surface, highly hydrophobic surface, face topography in contact with water, dust- and dirt-repellent surfaces, repellence to bacteria and fungi, Man-made fibers to be used under chemical stress are modified with diffusion-barrier layers on their surfaces without modifying the bulk properties, microwave applications for polymer solutions, Surface treatment with laser beam, ozonization of textile surfaces, Improving the fibre adhesion, by various surface treatment techniques, non-thermal ozone technology, effect on surface morphology, Phase change material (PCM) applications to textiles.

Period two-three months

Contact, tutor prof. Jakub Wiener, prof. Jiří Militký, Department of Material Engineering

Topic Bio Active Sensors for Detection of Toxicity Hazards of Textile Products

Specifications Biosensors, actuators, and control units, toxicity in textile materials, detection techniques, hazardous chemicals limit, conducting polymers on textile surfaces, nanoparticles and nanocoatings, composite fibres, biological protection, antibacterial, antifungal applications, UV protection, gas sensation, odor absorption, bio-smart materials for sports, medical, sanitary, child care, military and fashion applications.

Period two-three months

Contact, tutor prof. Jiří Militký, doc. Rajesh Mishra, Department of Material Engineering

Topic Prediction of Hand and Comfort Properties of Textiles

Specifications Quality of clothing is very essential for characterizing and determining the acceptability of textile products. Many attributes are recognized as major aesthetic parameters of a woven apparel fabric and measured by the objective measurement techniques. Evidently expressing the quality based on complex variant evaluation is of a universal character (fibers, yarns etc.) is successfully implemented. There are, of course, many other techniques; some of them (e.g. polar property diagram) do not even carry out any aggregation. The advantage of the complex quality criterion U manifests itself especially in the case when quality of a whole series of clothing textiles is being compared. It can be established that procedures for objective evaluation of textiles quality will keep on developing and they will thus simplify a complex optimization of clothing textiles manufacturing process in respect of their required utility. The application in the computer aided textile design will be more precisely oriented to the better quality of products. An integrated total quality index is estimated from these attributes after judiciously evaluating the fractional contribution of individual parameter with an expert opinion. The individual attribute measured by the iobjective method holds very good correlation with the conventional method of measurement. The newly evaluated degree of satisfaction (DS), which is normalized total appearance, also gives a very strong correlation with overall appearance of the fabric subjectively assessed by the experts.



Period two-three months

Contact, tutor doc. Rajesh Mishra, Department of Material Engineering

Topic Characterization of Acoustic Properties in Fibrous Assemblies

Specifications Tools for predicting hand and comfort properties, prediction of drape ability, correlation of hand parameters to mechanical properties, expressing the quality based on complex variant evaluation, objective evaluation of textiles quality, complex optimization of textiles manufacturing process in respect of their required utility, application of the computer aided textile design, Finite element analysis of structure property relationships, predicting air permeability, moisture transfer, heat transfer by numerical tools, correlation to porosity, modelling and simulation of thermal conductivity and convection through fibrous structures, characterization of results using suitable statistical tools.

Period two-three months

Contact, tutor doc. Rajesh Mishra, prof. Jiří Militký, doc. Dana Křemenáková Department of Material Engineering

Topic Composites and nanocomposites

Specifications Prediction of impact force for preparation of nanoparticles in ball milling, Investigation of interfacial properties of composites and nanocomposites, Determination of delamination resistance of laminated composites, and simulation of mechanical properties of composites and nanocomposites,

Period two-three months

Contact, tutor Dr. Vijay Baheti, Department of Material Engineering

Topic Protective materials and special applications

Specifications Development of flame retardant fibrous material, Development of flexible nanocellulose aerogel materials, Novel concepts of textile recycling

Period two-three months

Contact, tutor Dr. Vijay Baheti, Department of Material Engineering

Topic Composites and nanocomposites

Specifications Preparation of activated carbon by conventional and microwave heating, Evaluation of gas filtration properties of activated carbon materials, Development and characterization of cement and geopolymer concrete composites, Surface treatment of natural fibers, Characterization of multifunctional properties of nanoparticle coated textiles,

Period two-three months

Contact, tutor Dr. Vijay Baheti, Department of Material Engineering
