

C – Charakteristika studijního předmětu nebo tématického bloku	
Název studijního předmětu	Nanocomposites
Způsob zakončení	zkouška
Další požadavky na studenta	
Přednášející	doc. Rajesh Mishra, Ph.D.
Stručná anotace předmětu	
<p>This course will cover all major aspects of nanocomposites.</p> <p>Definition of composites, Classification of composite materials, Basics of composite manufacturing, Nanoscience and nanotechnology, nanoscale reinforcement materials, nanoscale mechanical behavior, nanoscale functional behavior.</p> <p>Nanoscale fibrous materials for composites, Brief introduction to various fibrous materials used for nanocomposite manufacturing: Glass fibre, Carbon fibre, Basalt, Aramid fibres, PBO, Sisal, Jute etc., Advantages of fibrous nanocomposites.</p> <p>Resin systems, Types of matrices, Thermoset resin, Thermoplastic resins, Polymer matrix (thermoplastic or thermoset) combined with a nanoscale textile reinforcement, Characterization of various matrices, Selection criteria of matrices for different nano materials, Bio-resins, Green composites with nanoscale material.</p> <p>Multi-phase composite systems, Various types of fillers and their properties, Organic nanofillers, Inorganic nanofillers, Nanoparticles from natural resources, Nanoparticles from industrial waste, Various ways of preparing nanoparticles, Engineered nano particles, Basic aspects related to nano particle formation, Classes of materials such as polymers, metals, and ceramics used for nano particles.</p> <p>Physical principles of nano particle preparation from textile fibers, Size & shape effect in nano scale, Methods for production of nano particles from textile fibers, Combustion synthesis, Vapour condensation process, Development of specific nanocomposites based on nanoparticles from textile waste, Filtration, Sound absorption, Tissue engineering, Insulation and other applications.</p> <p>Carbon nanostructures and nanocomposites, Synthesis of carbon nanocomposite materials, Specific functional properties of carbon nanocomposites, Applications.</p> <p>Cellulose nanocomposites, Cellulose as a source for nano scale materials, Cellulosic fibers for nano particle preparation, Advantages of cellulose nanocomposites, Application areas.</p> <p>Characterization of nanocomposites, Morphology, Molecular structure, Mechanical properties, Thermal behaviour, Chemical behaviour, Optical behaviour.</p>	

Functionalization of nano particles on textile surfaces for nanocomposite systems, Modification of the particle surface, Application of functionalised nano particles to textiles, Nano finishing, Protective clothing, Tissue engineering, Affinity membranes, NanoSensors, UV protection, Miscellaneous areas.

Textile structural nanocomposites, Woven preforms for nanocomposite systems, 3D woven nanocomposites, Impact tolerance, Penetration resistance of 3D nanocomposites, Electrical properties, Thermal properties, Acoustic properties, Electromagnetic resistance.

Test methods, Testing of nanoreinforcement structures, testing of matrix materials, testing of nanocomposite parts, Mechanical analysis, Delamination test, Fatigue analysis, Damage analysis, Environmental test, Aging of nanocomposites

Automotives, marine, agriculture, medicine, cosmetics, aerospace, sports, biomedical applications, civil engineering, machine components, wind energy, ballistic and other body armour applications, pressure vessel, shelter house.

Nanorisks and nanohazards with nano particles and nanocomposites, Introduction to special testing methods, Protection from nano hazards. Nano-composites in the twenty-first century.

Odborná literatura

Jeevani T.: Nanotextiles-a broader perspective, J. Nanomedic. Nanotechnol. 2, 2-7 (2011)

Sawhney A.P.S., et al.: Modern Applications of Nanotechnology in Textiles, Text. Res. J. 78; 731 – 739, (2008)

Qian L., Hinestroza J. P.: Application of nanotechnology for high performance textiles, JTATM 4, 1-7 (2004)

Brown P., and Stevens K.: Nanofibers and Nanotechnology in Textiles. Elsevier Science, 2007