VISEGRAD STRATEGIC GRANT

ID: **22010345**

Project title: **Engineering platform and cooperation in area of nanocomposites**

Focus area/objective: **(Strategic) Small Things Matter**

Online seminars in the area: **Nanomaterials for electrical engineering**

Dear Colleagues, I would like to draw attention for our commonly activity organized with cooperation with foreign universities (V4 area).

Every two weeks there will be 2 lectures, a total of 4 times.

1. 17th March
2. 31th March
3. 14th April
4. 28th April

The lectures will start at 10:00 AM.

More information and abstracts can be found on the website

https://fyzika.uniza.sk/visegradfund/nanomaterials-for-electrical-engineering/

The next program od lectures is described below.

The meetings will take place in Webex.

Duration: 1 hours

Date and time: **17.3.2021** at 10:00 AM (CET).

Event address for attendees:

https://etwinning.webex.com/etwinning/onstage/g.php?MTID=e702407cf294b33c0eca81a2973ff8e9a **(**Event password: A4Ypmp7icu5**)**

The name of the lecturer: **Ing. Jaroslav Hornak, Ph.D., University of West Bohemia**

The names of online lecture: **The influence of the incorporation of nanostructured fillers on the material properties of potting compounds**

***Abstract of the lecture*:**

The main aim of this research is to present the effect of different nanostructured fillers (single metal oxides) on dielectric and mechanical properties. Silicon dioxide (SiO_2), Magnesium oxide (MgO), Aluminium oxide (Al_2O_3), Zinc oxide (ZnO), and Titanium dioxide (TiO_2) with an average size ≤ 30 nm have been dispersed (1% wt) in two-component transparent cold-curing epoxy resin. The loss factor, relative permittivity, and volume resistivity have been evaluated from the point of view of dielectric parameters. The tensile strength and elongation of selected composites have been investigated as well. Research brings promising results of the possible incorporation of Magnesium oxide nanofiller. Another goal of this work is to study the effect of incorporation of tubular halloysite (HNT) in higher concentrations concerning the above-mentioned properties. This incorporation may be beneficial in the case under fire conditions.

The name of the lecturer: **Assoc. Prof. Ing. Pavel Trnka, Ph.D., University of West Bohemia**

The names of online lecture: **Dielectric liquids, history, diagnostic and issue of nanofluids**

***Abstract of the lecture*:**

Dielectric liquids are an inseparable part of various electrical appliances and machines. They are used in cables, switches, capacitors, and transformers. The presentation covers a brief history of using dielectric liquids, diagnostic methods used for dielectric liquids, searching for new liquids proper for the environment, and sustainable development. Addressed will be the problems with material compatibility, different physical properties of new liquids, and new nanofluids.

Date and time: **31.3.2021** at 10:00 AM (CETS).

Event address for attendees:

https://etwinning.webex.com/etwinning/onstage/g.php?MTID=eb1ad7eb32b39e2fd5afcac60703f19f5 (Event password: s2fScpPD3Q4**)**

The name of the lecturer: **Prof. Inž. Tomasz N. Koltunowicz, Ph.D., Lublin University of Technology**

The names of online lecture: **Production, research and application of metal-dielectric nanocomposites on the example of $(FeCoZr)_x(CaF_2)_{(100-x)}$ nanocomposites**

***Abstract of the lecture*:**

This presentation presents fabrication, chemical composition, structure and AC electrical properties of metal-dielectric nanocomposites on the example of $(FeCoZr)_x(CaF_2)_{(100-x)}$ material prepared by sputtering with argon and oxygen-doped argon ion beams. Investigations were carried out on samples just after fabrication (not annealed) and after annealing at temperatures from 373 K to 673 K. The electrical properties (resistance, capacitance, phase shift angle, loss angle tangent and conductivity) were determined for frequencies from 50 Hz to 1 MHz for measuring temperatures from 20 K to 373 K. Structural and electrical properties were analysed as a function of dielectric composition, type of sputtering beam (Ar and $Ar+O_2$). The changes under high-temperature annealing were determined and the possibility of their application to produce elements with resonant circuit properties was analyzed.

The name of the lecturer: **prof. Ing. Miroslav Gutten, Ph.D. , University of Žilina**

The names of online lecture: **Diagnostic of power transformers and their insulation materials**

***Abstract of the lecture*:** The aim of the research is the analyzing of insulation and construction condition of various high-voltage transformers with respect to the degradation effects of operation and environment. The main attention is devoted to diagnostics of insulating and construction state of transformer, where for the dry devices they are mainly epoxy resins and in the oil devices it is oil-paper insulation. The effects of short-circuit and inrush currents, overload, overvoltage, environmental effects and other operating factors on the degradation effects of insulating elements was analyzed. Subsequently, the effect of partial discharges in the transformer insulation, which has a direct impact on the degradation of the insulating state, was analyzed. The process of their formation, extension and influence on the insulation of the transformer was described. New measurement procedures, diagnostic methods and systems will be proposed, the results of which will be used to determine the degree of degradation of insulating and construction elements of the transformers (core, windings, taps).

Date and time: **14.4.2021** at 10:00 AM (CETS).

Event address for attendees:

https://etwinning.webex.com/etwinning/onstage/g.php?MTID=e4a2c11c67a09cf8fec3f57af04f4de63 **(**Event password: ktCfG3jxH72**)**

The name of the lecturer: **Assoc. Prof. Zoltán Ádám Tamus, Ph.D., Budapest University of Technology and Economics**

The names of online lecture: **Measurement of dielectric response as a tool for insulation diagnosis and material characterization**

***Abstract of the lecture*:**

The dielectric response can be investigated in the frequency and time domain, as well. In the frequency domain, it can be measured by the application of sinusoid voltage on the dielectric and the complex dielectric constant is determined from the amplitude and the phase of the current flowing through the sample. In the time domain, a step voltage is applied to the sample, and the current responses, namely the polarization and depolarization currents, are measured. The measurement of the voltage response of a charged insulation can also characterize insulating materials in the time domain. However, the frequency and time domain measurements provide the same information about the tested insulating material, several evaluation methods have been developed.
This presentation summarizes the nature of the dielectric response and its measurement and evaluation techniques. The application of different methods is also introduced by some examples.

The name of the lecturer: **Assoc. Prof. RNDr. Jozef Kúdelčík, Ph.D. , University of Žilina**

The names of online lecture: **Acoustic and dielectric diagnostic of insulation materials**

***Abstract of the lecture*:**

Acoustic and dielectric diagnostics belong to the non-destructive methods of materials analysis. The use of these two methods is presented at a study of changes in the properties of magnetic fluids based on transformer oil due to the external fields. A magnetic field, smaller as 100 mT, can create new structures from magnetic nanoparticles, which significantly influence on an attenuation of the acoustic wave. Using dielectric measurements, the magneto-electric effect of permittivity and dissipation factor are observed. For all types of measurements, a significant temperature dependence of the studied parameters is observed.

Date and time: **28.4.2021** at 10:00 AM (CETS).

Event address for attendees:

https://etwinning.webex.com/etwinning/onstage/g.php?MTID=e21da6fd45c4254e8ccadde208a162422 **(**Event password: k7bQH8y7vDe**)**

The name of the lecturer: **prof. Ing. Pavel Trnka, Ph.D., University of West Bohemia**

The names of online lecture: **Using the aging models for modern EIS lifetime prediction**

***Abstract of the lecture*:**

Along with the introduction of online diagnostic systems for the electrical equipment state examination, software solutions for the processing of acquired data are also gaining importance. One way to predict the future state of equipment is to use aging models for its components. The lecture will deal with ways of obtaining aging models, determining their parameters and endpoint criteria. Finally, the possibility of using models for emerging nanomaterials will be evaluated.

The name of the lecturer: **Ing. Štefan Hardoň, Ph.D., University of Žilina**

The names of online lecture: **The dielectric spectroscopy of epoxy resin with nanoparticles**

***Abstract of the lecture*:**

The goal of this contribution is show the influence of different concentrations (0.5, 1.0, and 2.0 wt.%) of Zinc Oxide (ZnO) filler on the dielectric properties of the cold-curing polyurethane resin (Vukol 022). Next are the various types of nanoparticle fillers incorporated into the polyurethane (VUKOL 022) matrix and its subsequent changes in the complex permittivity. Two types of surface modifications of SiO_2 (n-SiO_2, and f-SiO_2) and MgO, TiO_2 fillers were investigated. In all type of used fillers the frequency dependence of the real and imaginary parts of complex permittivity was measured within the frequency range 1 mHz - 1 MHz using the capacitance method. The frequency dependence of its relative real and imaginary components for the temperature range from 20 ^oC to 100 ^oC was measured.