

UNIVERSITY OF ŽILINA

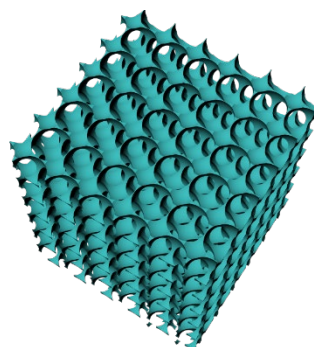
FACULTY OF ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGY

3D printing task

Topic: „Nature-inspired microstructures“

Goal:

Natural structural coloration is given by physical phenomena of light interference on nanostructures. Such natural photonic structures are attracting increasing interest in a wide variety of research fields. Inspired by the natural creatures, many elaborately nanostructured photonic structures with variable structural colors were developed. These nature-inspired structures have found important applications in switches, display devices, sensors, and so on. There are three different spatial arrangements creating one- (1D), two- (2D) and three-dimensional (3D) structures. Especially 1D structures can be found in some plant flowers in the form of multilayers widely existing in some insects, birds, fish, plant leaves and berries. Some discrete 1D periodicity can be found in Morpho butterflies. Natural surfaces with 2D gratings are used for antireflection and self-cleaning by some nocturnal insects, such as moths and some butterflies or as cylindrical voids that are embedded in a high-refractive-index solid medium creating iridescent hairs of certain marine worms. **Inverse opal** analogous 3D nanostructures generate the iridescence of several species of exotic butterflies, such as the *Parides sesostris*.



The following sub tasks will be due:

- Research on natural photonic structures and phenomena of structural coloration in nature
- Defining the functionality and physical requirements
- Creating a 3D model using CAD software (Autodesk Inventor, Blender, SolidWorks, ...)
- Selecting appropriate 3D printing methods and materials
- Printing and testing different natural inspired structures, measuring morphology in confocal laser microscope and measuring spectral transmittance and reflectance spectrum.

Professor: Prof. Ing. Dušan Pudiš, PhD.

Supervisor: Ing. Peter Gašo, PhD.

Contact: gaso@fyzika.uniza.sk
+421 41 513 2320