Behavior of different PLA sandwich structures loaded in three points bending

G.G. Jiga[1*], M.G. Burtoiu[2], N.E. Pascu[3], T.G. Dobrescu[4]
[1]*University POLITEHNICA of Bucharest, Dept. of Strength of Materials, gabriel.jiga@upb.ro*
[2]*YOKOGAWA Company, Bucharest, mircea.gabriel25@yahoo.com*
[3]*University POLITEHNICA of Bucharest, Dept. of Engineering graphics and Industrial Design, nicoletaelisabeta_pascu@yahoo.ro*
[4]*University POLITEHNICA of Bucharest, Dept. of Robotics and Production Systems, tiberiudobrescu@yahoo.com*

Keywords.
3D printing, sandwich structure, honeycomb core, bending

Abstract.
Sandwich structures can be classed as composite materials in that they consist of two or more individual components of differing properties which when combined result in a high performance material. In contrast to monolithic composites - which consist of an intimate mixture of fibres (glass, kevlar, carbon, metal etc.) supported within a continuous matrix (e.g. thermoplastic or thermoset resin) - sandwich structures have a discrete structure in which a core material is bonded to, and faced with, a skin material. The skin material usually has a high stiffness, whereas the core typically has high compressive and shear strength. When these are bonded together, this combination gives the sandwich structure a high flexural modulus. The primary advantage of a sandwich composite is very high stiffness-to-weight and high bending strength-to-weight ratio. The sandwich enhances the flexural rigidity of the structure without adding substantial weight. The cores used in load carrying sandwich constructions can be divided into four main groups; corrugated, honeycomb, balsa wood and foams. First of all the core should possess low density in order to add as little as possible to the total weight of the sandwich construction. The core is mainly subjected to shear and the core shear strains produce global deformations and core shear stresses. In this paper three different core configurations have been studied: honeycomb, inversed haneycomb and kagome bonded to aluminum skins. The cores were made from PLA using the FDM (fusion deposition method) procedure, on a 3D printer.