

## ABSTRACT

Natural structures have a very complex structure and organization of materials. This gives them much higher structural strength and other physical properties than the properties of their constituents components. In this thesis, the structural arrangement of material is compared with the optimal organization of the constituent materials of the plant stem under a similar loading constraint. Bamboo is particularly used for its structural strength to weight ratio. We first discuss the optimality of the radial distribution of material along a cross-section. Then, we discuss the development of the code for generating optimal 2D double-scale structures composed of periodic microstructures for the given boundary conditions.