

***Topology Optimization of 3D Structures Subjected to Contact Conditions***  
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This lecture describes the application of topology optimal design methodologies to the optimization three dimensional elastic bodies subjected to contact conditions. The model is an extension of the model presented in Fernandes et al. (1999), with the equilibrium equations expressed in a way to accommodate the contact conditions. The necessary conditions for optimum are derived analytically based on the Augmented Lagrangian associated with the problem. The methodology is similar to the one proposed by Rodrigues (1993) for shape optimization of mechanical components.

Several applications to illustrate the developments presented will be shown. These applications are not only in pure mechanical applications but also for orthopaedic implants where the interface bone/implant requires a very careful modelling and considering the two bodies in contact is the correct approach.

Fernandes P. R., Guedes J.M. and Rodrigues H., (1999) “Topology Optimization of 3D Linear Elastic Structures”, *Computers & Structures*, 73, pp. 583-594.

Rodrigues H., (1993) A Mixed Variational Formulation for Shape Optimization of Solids with Contact Conditions, *Structural Optimization*, 6, pp. 19-28.