Introduction to the theory of
shells and beams

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● *10 October 2018*
10.30-13.00
DIEF – Seminar room

● *17 October 2018*
10.30-13.00
DIEF – Seminar room

● *25 October 2018*
10.30-13.00
Aula Caminetto

Via di S.Marta 3 - Firenze
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Summary

Geometry The concept of surface. Curvatures: gaussian, geodesic, scalar. Planar curves: similar topics. Classical results: Theorema Egregium, isometric embedding problem. Surface differential operator: surface gradient, surface divergence, Laplace-Beltrami operator. Surface divergence theorem. Examples.

Shells Deformation of a surface. Surface strain and bending strain tensors. Linearization of the change of curvature. Kirchhoff-Love deformations. Linear shells. Equilibrium equations: justification by virtual power principle, justification by an asymptotic analysis (very lightly). Naghdi's theory: shear deformations. Stored energy of shells and beams. Elementary convexity. Plates.

Planar beams Linear beams: Bernoulli-Euler theory. Timoshenko's theory: shear deformations. Rectilinear beams. Euler's elastica. Examples.

References
1 - Ciarlet, P. G.: Mathematical elasticity, Volume II: Theory of plates Gauthier–Villars, North Holland, Amsterdam 1997
2 - Ciarlet, P. G.: Mathematical elasticity, Volume III: Theory of Shells North-Holland, Amsterdam 2000
3 - Do Carmo,M.: Differential geometry of curves and surfaces Prentice Hall, New Jersey 1976
4 - Villaggio, P.: Mathematical models for elastic structures Cambridge University Press, Cambridge 1997