Rome-Moscow School, September 2016

Carla Manni

All the material presented in my lectures of September 6, 2016 can be found (with all the details and many proofs) in the paper

1. C. Garoni, **C. Manni**, F. Pelosi, S. Serra-Capizzano, H. Speleers: *On the spectrum of stiffness matrices arising from isogeometric analysis*, Numerische Mathematik, 127 (2014) 751–799.

To deepen the comprehension of the lectures, I suggest to address the following Exercise. Its solution can be found in the paper above.

Exercise

Let us consider the differential problem

$$\begin{cases} -\Delta u = \mathrm{f}, & \text{in } [0,1]^2, \\ u = 0, & \text{on } \partial([0,1]^2), \end{cases} \qquad \mathrm{f} \in L_2(\Omega).$$

- write the weak form of the problem;
- discretize the above weak form by using the Galerkin method based on the bivariate functions;

$$N_{i,p}(x)N_{j,p}(y), \quad i,j = 2,\ldots,n+p-1, \quad (x,y) \in [0,1]^2$$

- express the resulting stiffness matrix in term of the matrices

$$K_n^{[p]},\ M_n^{[p]}$$

  used in the one dimensional case;
- analyze the spectral distribution of the stiffness matrix.