

**Course Syllabus for  
Electrical and Information Engineering PhD  
(years 2022-23 /2023-24)**

<b>Course title</b>	Numerical Methods for Big Data
<b>Scientific Discipline Sector</b>	MAT/08
<b>Hours of instruction</b>	20 hours
<b>CFU</b>	2 CFU
<b>Semester</b>	Second semester
<b>Goal</b>	<p>The course will describe the numerical methods that facilitate the analysis of big data, network analysis and many machine learning applications.</p> <p>Their implementation in Matlab will be addressed, together with the use of modern Matlab toolboxes for large and sparse data; applications to the solution of real-life problems will be considered.</p> <p>Each lesson shall consist in lecture and numerical examples.</p>
<b>Syllabus</b>	<p>Numerical methods for eigenvalue problems</p> <p>Numerical methods for Large Linear Systems (Iterative methods and Preconditioning)</p> <p>Singular Value Decomposition and Compression Methods</p> <p>Principal component analysis and dimensionality reduction</p> <p>PageRank</p>
<b>Bibliography</b>	<p>Lars Elden, <i>Matrix Methods in Data Mining and Pattern Recognition</i>, Philadelphia, SIAM, 2019</p> <p>Saad Yousef, <i>Numerical Methods for Large Eigenvalues Problems</i>, Philadelphia, SIAM, 2011. Revised Edition</p> <p>Slides and support material from lecturer.</p>
<b>Examination method</b>	Final examination in class