



Programme of Module "Modelling and control of networked distributed systems"

- Code: DT0011
- Type of course unit: Compulsory (Master Degree in Mathematical Engineering curriculum Comune)
- Level of course unit: Postgraduate Degrees
- Semester: 1

Number of ects credits: (Master Degree in Mathematical Engineering) 6 (workload 150 hours)

Teachers: Giordano Pola

1	<b>Course objectives</b>	The aim of this course is to provide basic knowledge of the analysis and design of dynamic multiagent networks.
2	<b>Course content and learning outcomes (dublin descriptors)</b>	<p>Topics of the module include:</p> <ul style="list-style-type: none"> <li>• Introduction to graph theory: graphs; matrices representation; algebraic and spectral graph theory; graph symmetries.</li> <li>• The agreement protocol - the static case: undirected and directed networks; agreement and markov chains; the Factorization Lemma.</li> <li>• The agreement protocol - Lyapunov and LaSalle: agreement via Lyapunov functions, agreement over switching digraphs, edge agreement, generalizations to nonlinear systems.</li> <li>• Formation Control: formation specification-shapes and relative states; shape based control; relative state based control, dynamic formation selection, assigning roles.</li> <li>• Mobile Robots: Cooperative robotics; weighted graph based feedback; dynamic graphs; formation control revisited; the coverage problem.</li> </ul>
3	<b>Course prerequisites</b>	Linear Algebra. Linear control systems. Stability theory for linear control systems.
4	<b>Teaching methods and language</b>	<p>Lectures and exercises.</p> <p><b>Language:</b> English</p> <p><b>Reference textbooks</b></p> <ul style="list-style-type: none"> <li>• M. Mesbahi and M. Egerstedt, <b>Graph Theoretic Methods in Multiagent Networks</b>. Princeton University Press. 2010. <a href="http://press.princeton.edu/titles/9230.html">http://press.princeton.edu/titles/9230.html</a></li> </ul>
5	<b>Assessment methods</b>	Written and oral exam